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Park et al.

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(54) **CONNECTION MODULE AND MOBILE TERMINAL HAVING THE SAME**

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(51) **Int. Cl.**

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H01R 12/71	(2011.01)
H01H 13/705	(2006.01)
H04M 1/23	(2006.01)
H01R 13/24	(2006.01)

(52) **U.S. Cl.**

CPC ***H01R 12/714*** (2013.01); ***H01H 13/705*** (2013.01); ***H04M 1/236*** (2013.01); *H01H 2207/032* (2013.01); *H01H 2223/014* (2013.01); *H01H 2225/028* (2013.01); *H01R 13/2428* (2013.01)

(58) **Field of Classification Search**

CPC .. H01H 1/403; H01H 1/5805; H01H 19/585; H01H 13/70; H01H 13/705

USPC 200/292, 341, 296, 516–517

See application file for complete search history.

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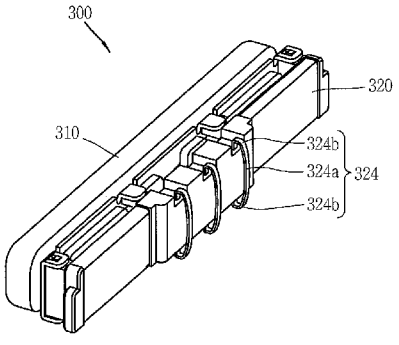
(57) **ABSTRACT**

A connecting module includes: a body with conductive contact points formed on one surface; and a connecting terminal that is formed to be exposed to the other surface of the body and electrically connected to the conductive contact points, the connecting terminal including: a deformation portion that is elastically deformed in a direction toward or away from the body; and first and second support portions that are respectively formed on both sides of the deformation portion to support the deformation portion and integrally attached to the body.

14 Claims, 19 Drawing Sheets



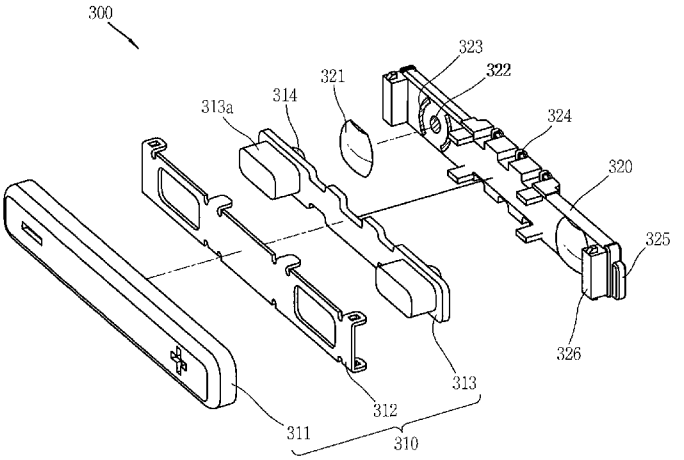


FIG. 1

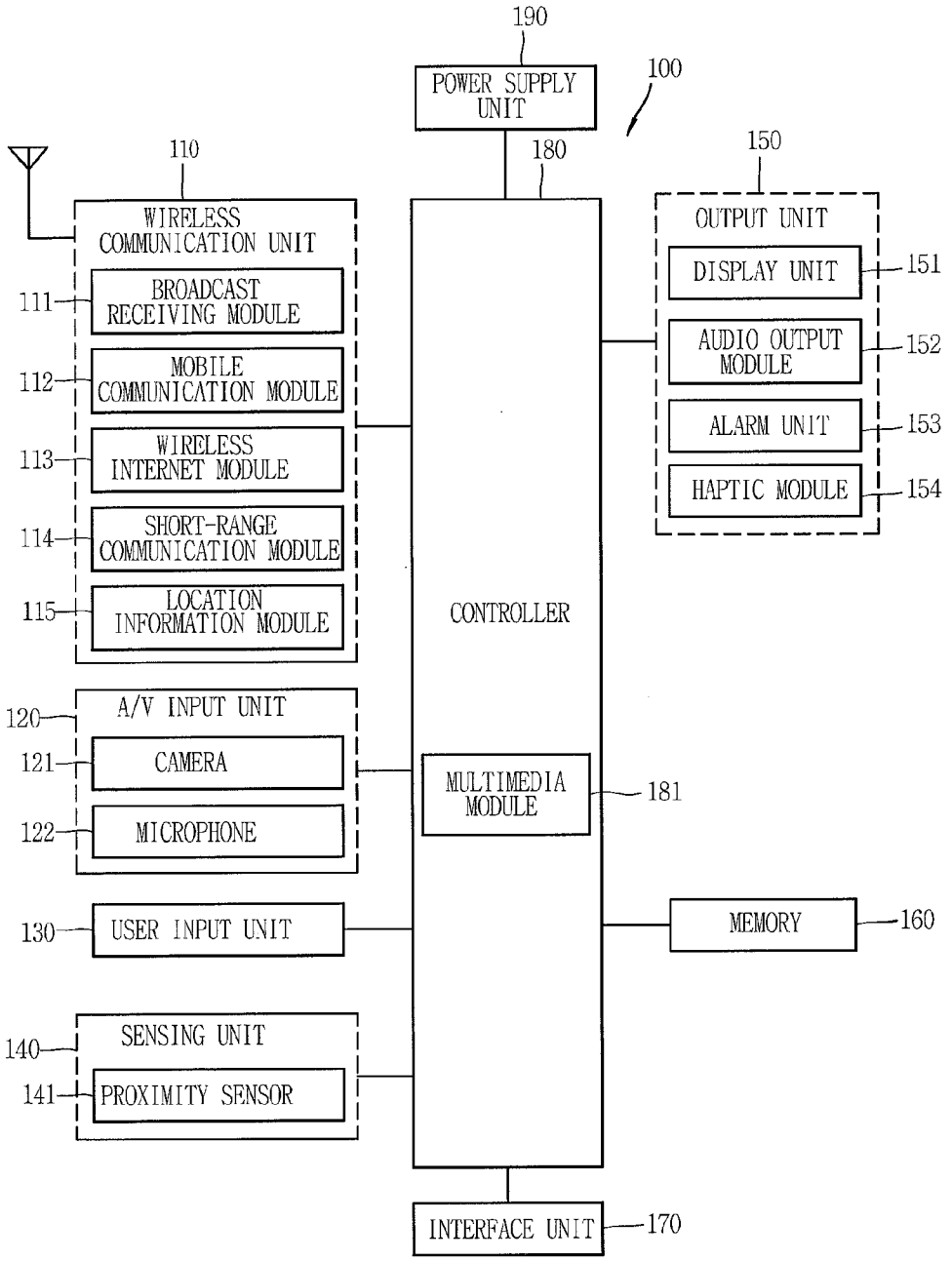

190
POWER SUPPLY UNIT
100
110
180
150
WIRELESS COMMUNICATION UNIT
OUTPUT UNIT
111
BROADCAST RECEIVING MODULE
DISPLAY UNIT
151
112
MOBILE COMMUNICATION MODULE
AUDIO OUTPUT MODULE
152
113
WIRELESS INTERNET MODULE
ALARM UNIT
153
114
SHORT-RANGE COMMUNICATION MODULE
HAPTIC MODULE
154
115
LOCATION INFORMATION MODULE
CONTROLLER
120
A/V INPUT UNIT
121
CAMERA
MULTIMEDIA MODULE
181
122
MICROPHONE
130
USER INPUT UNIT
MEMORY
160
140
SENSING UNIT
141
PROXIMITY SENSOR
INTERFACE UNIT
170

FIG. 2

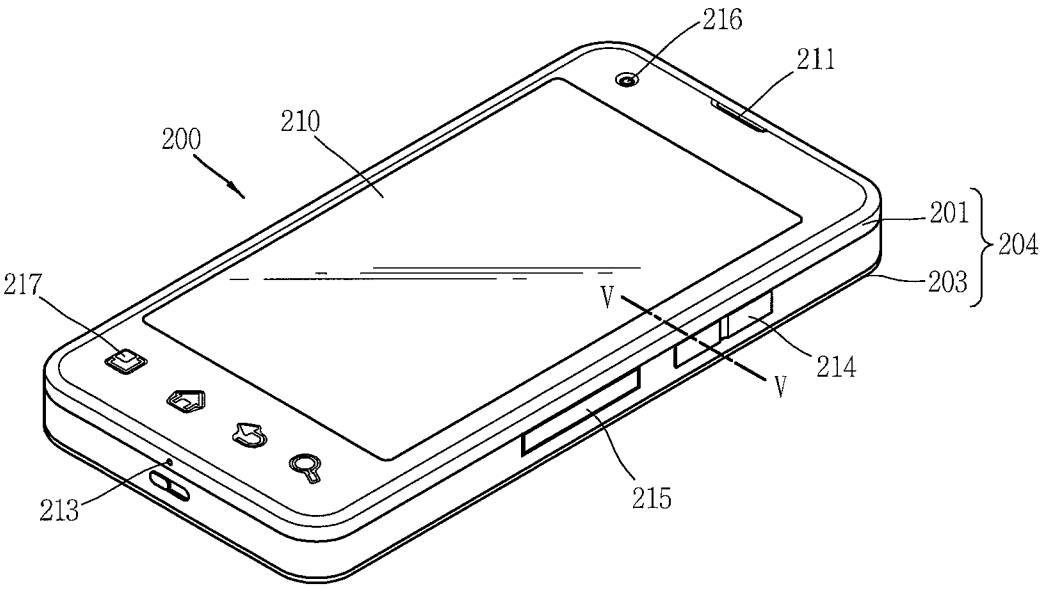
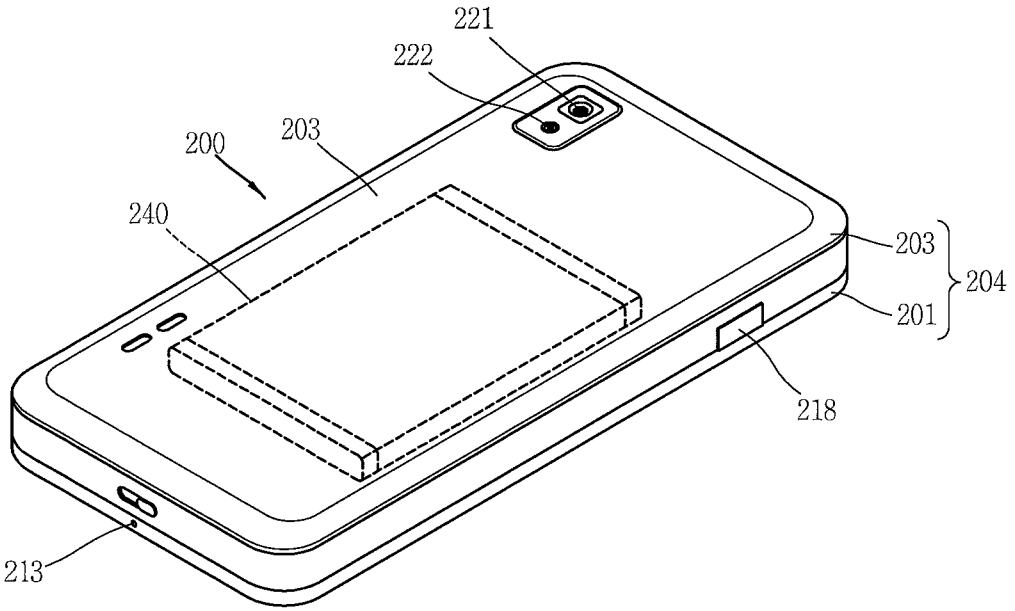

216
211
210
200
201
204
203
217
V
V
214
213
215

FIG. 3


221
222
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240
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204
201
218
213

FIG. 4

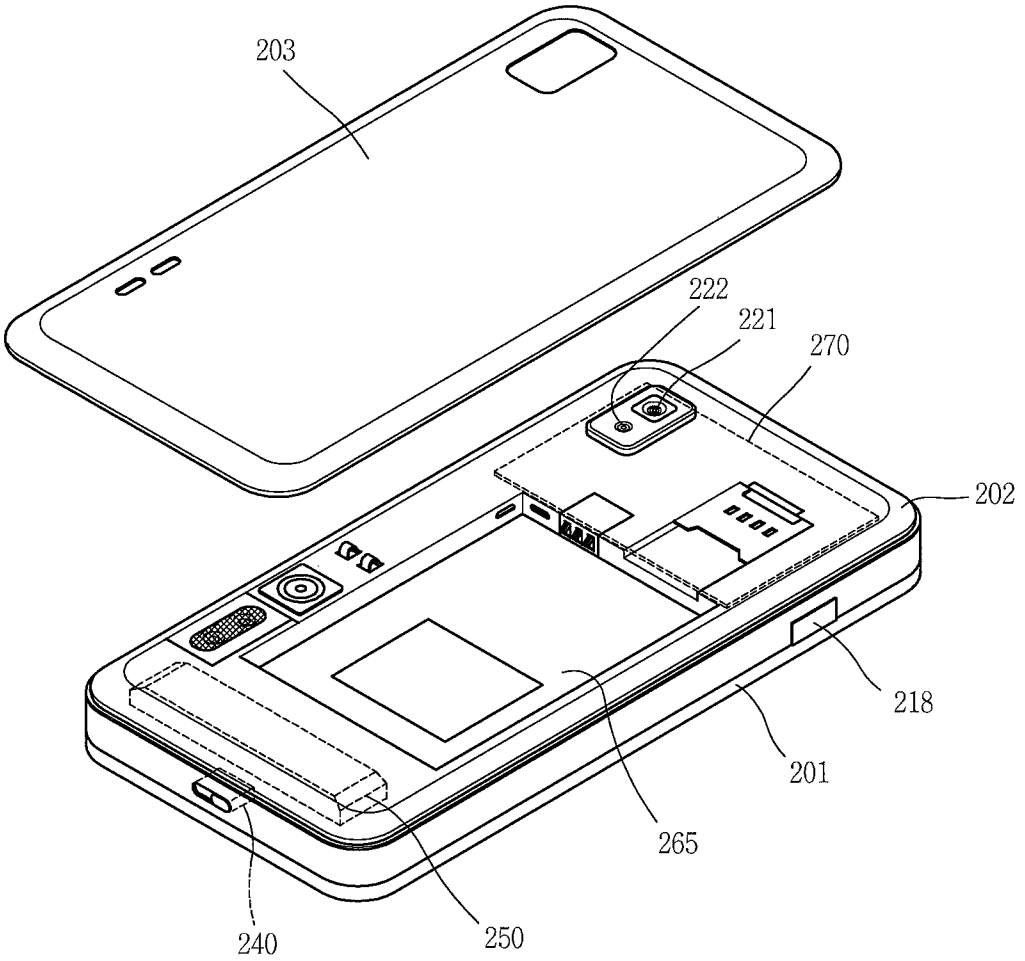


FIG. 5

Prior Art

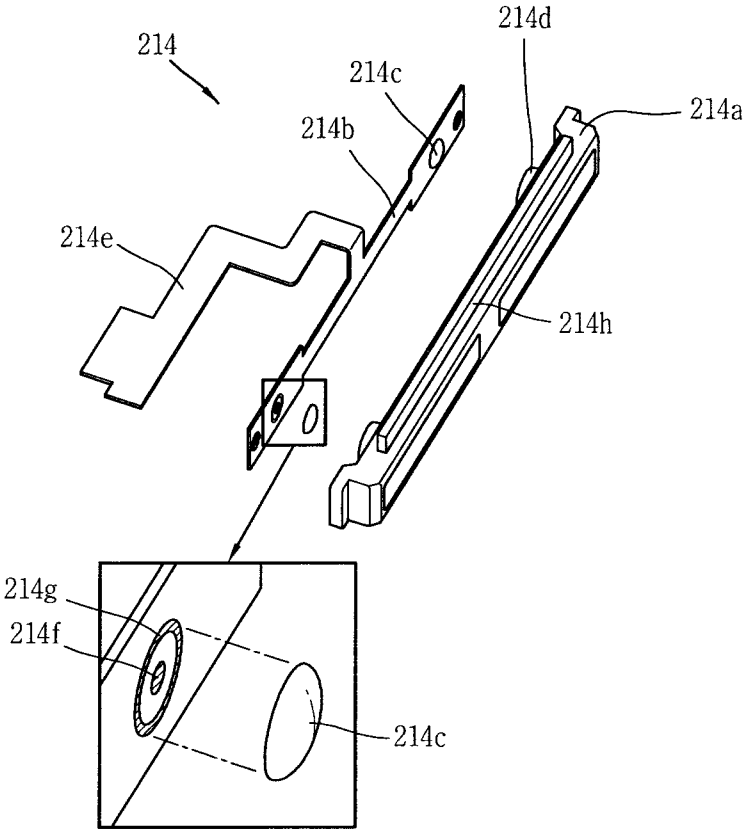


FIG. 6a

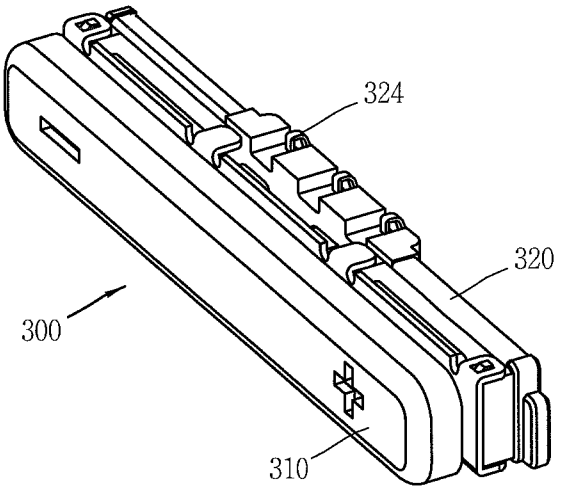


FIG. 6b

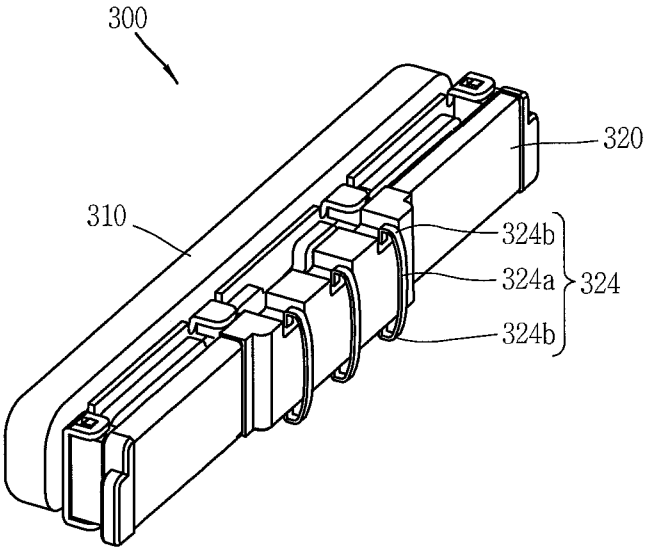


FIG. 6c

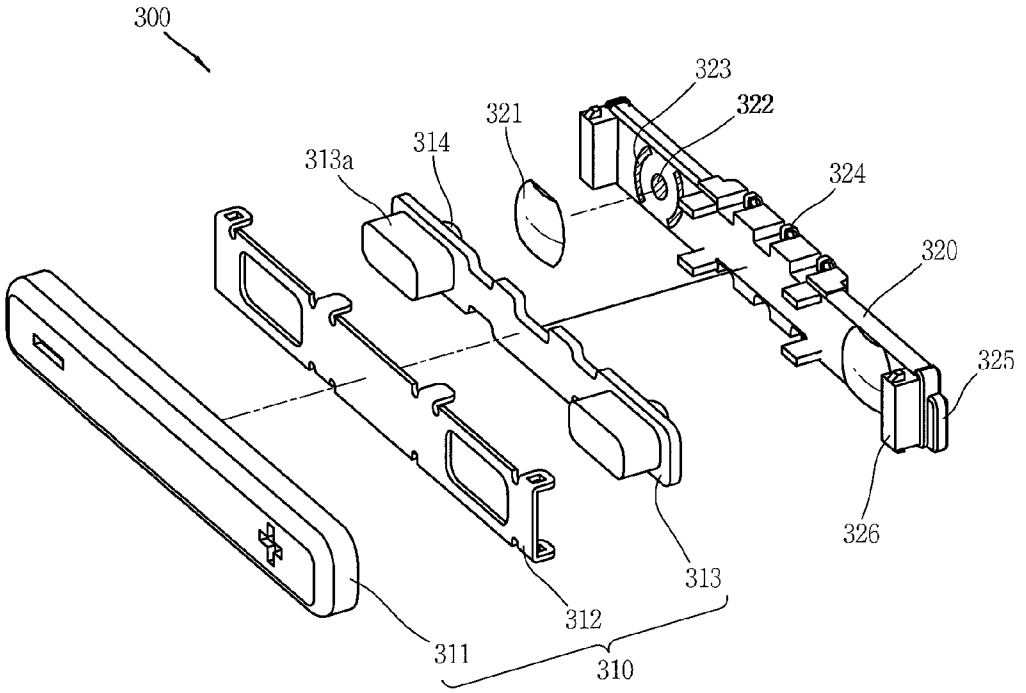


FIG. 7a

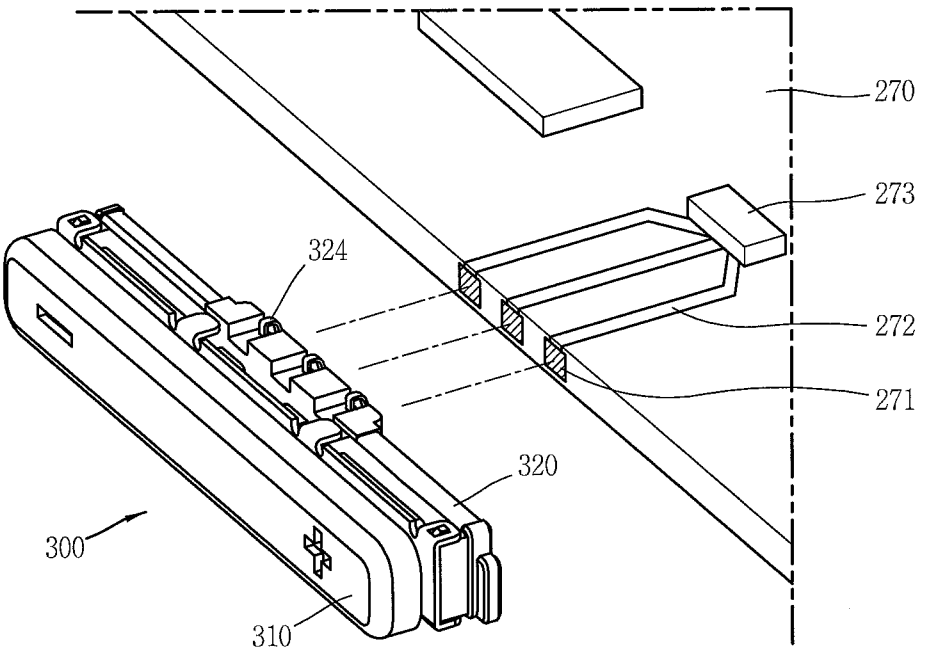


FIG. 7b

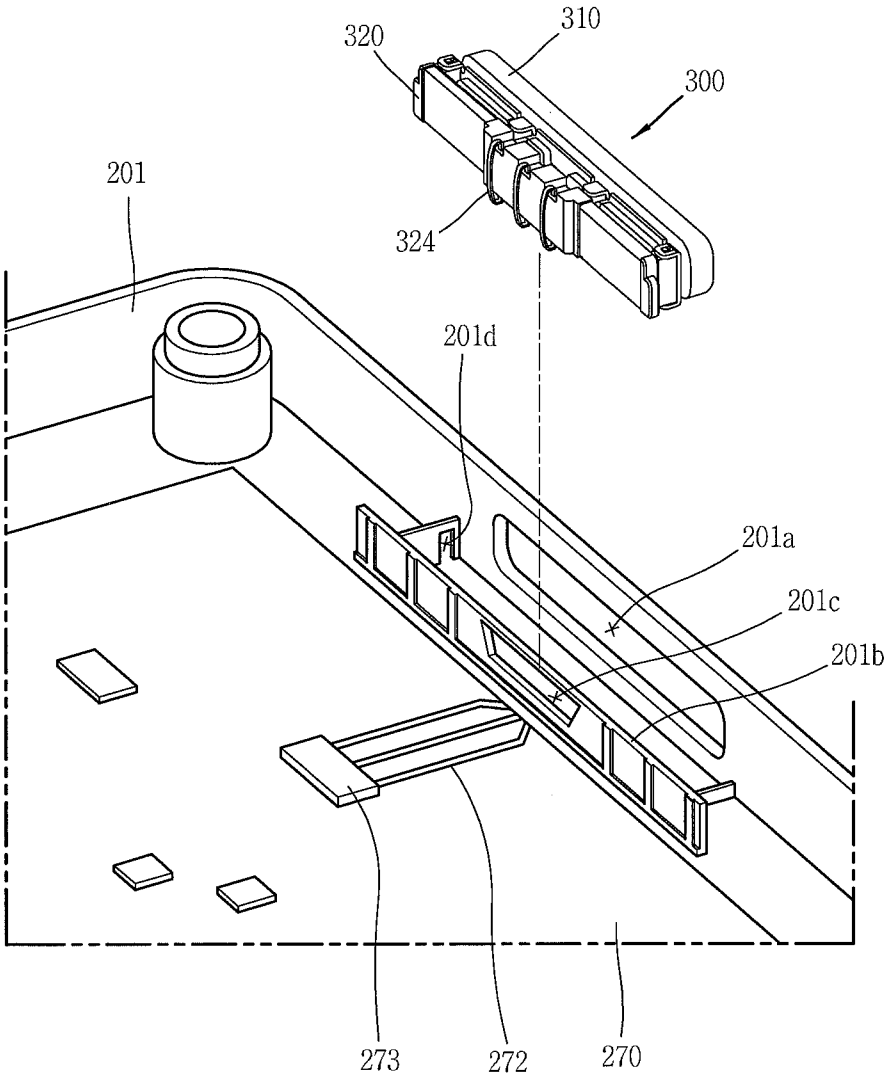


FIG. 8a

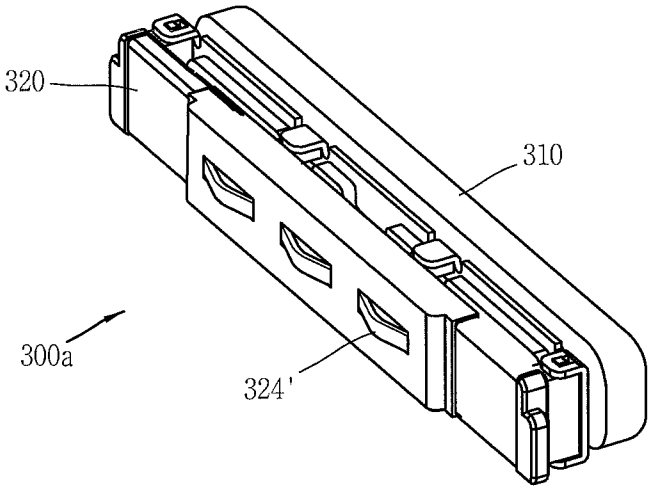


FIG. 8b

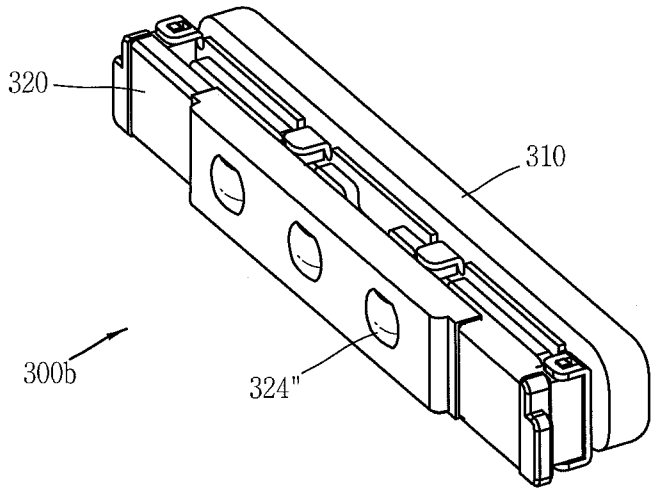


FIG. 9

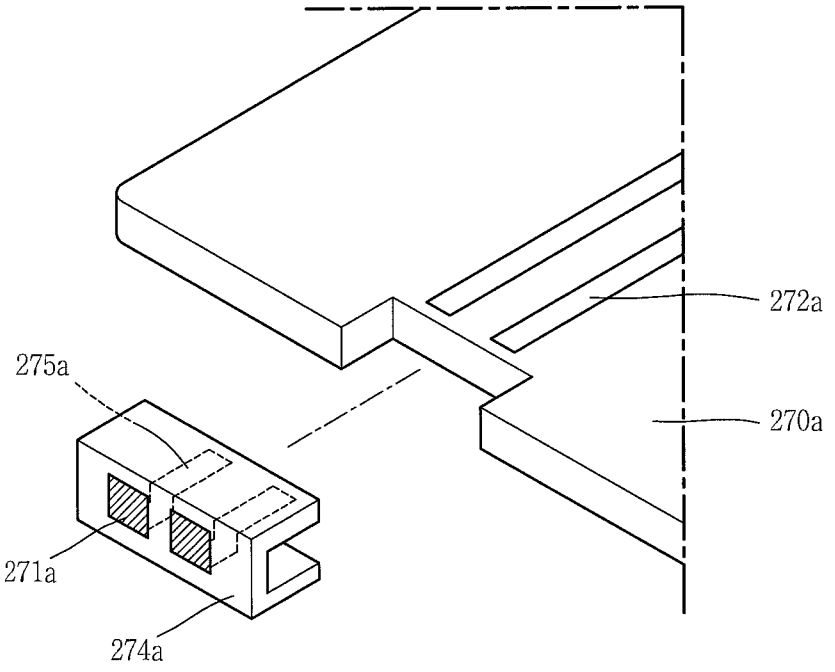


FIG. 10a
Prior Art

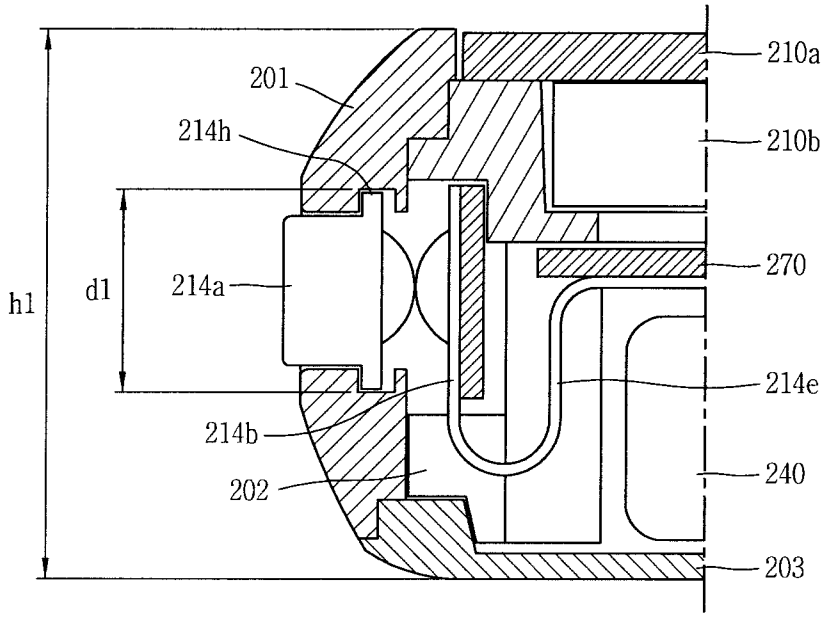


FIG. 10b
Prior Art

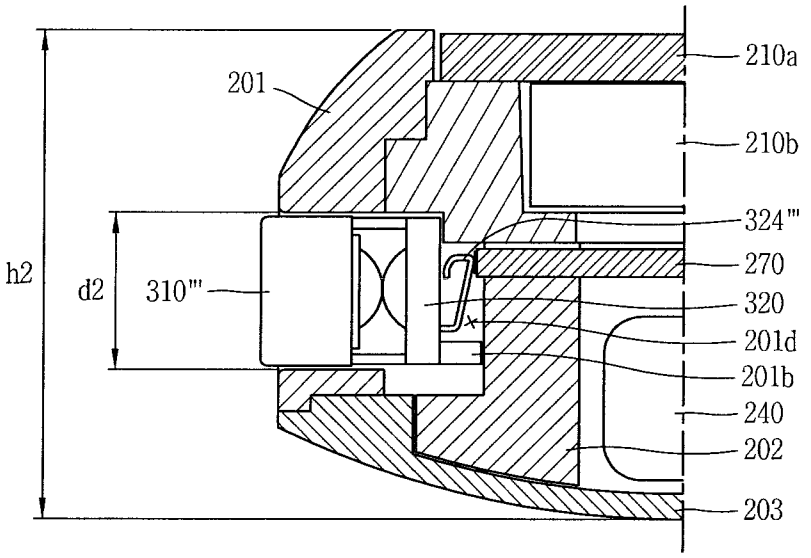


FIG. 10c

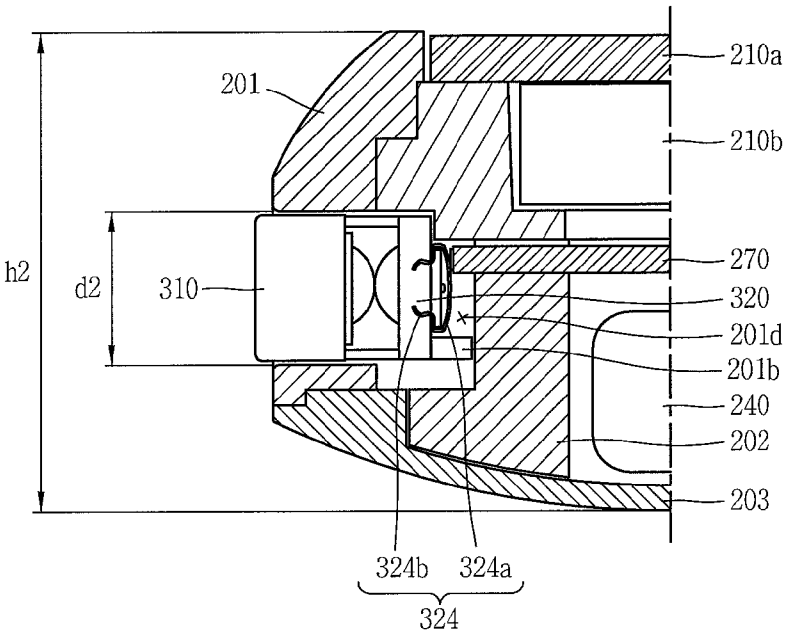


FIG. 10d

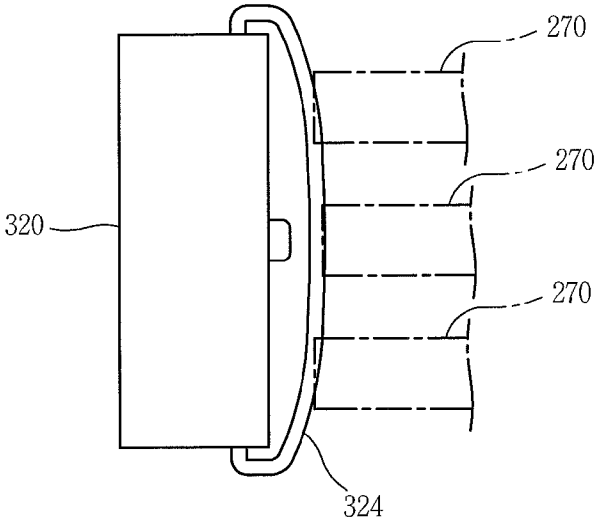


FIG. 11a

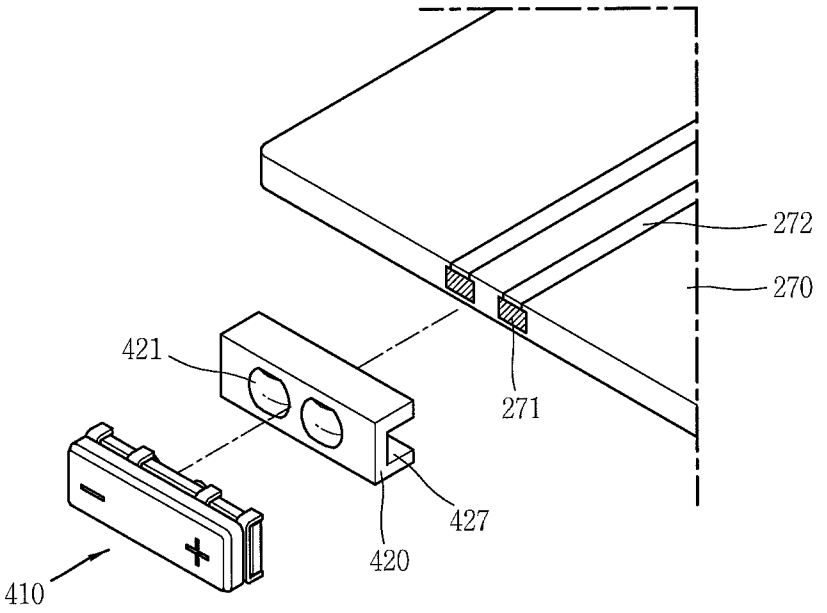


FIG. 11b

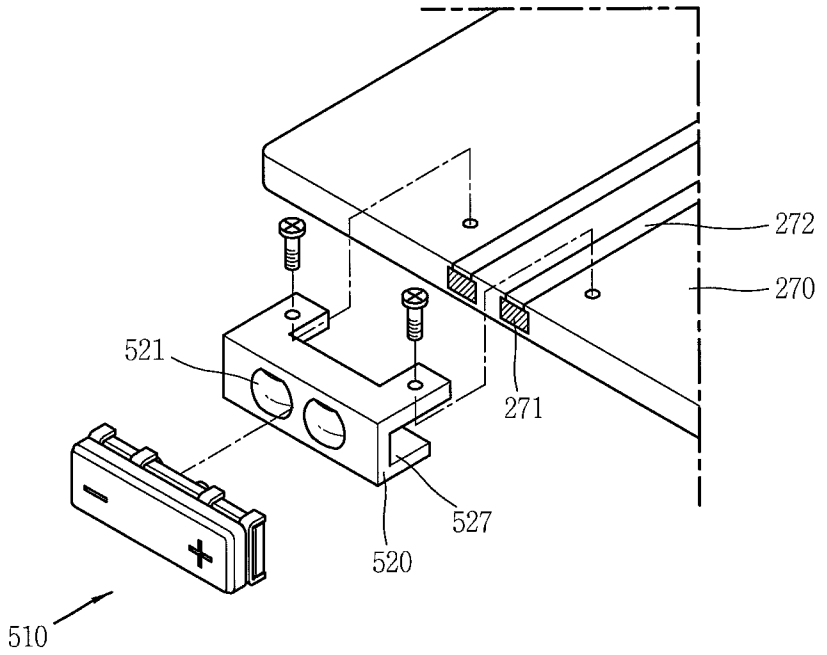


FIG. 11c

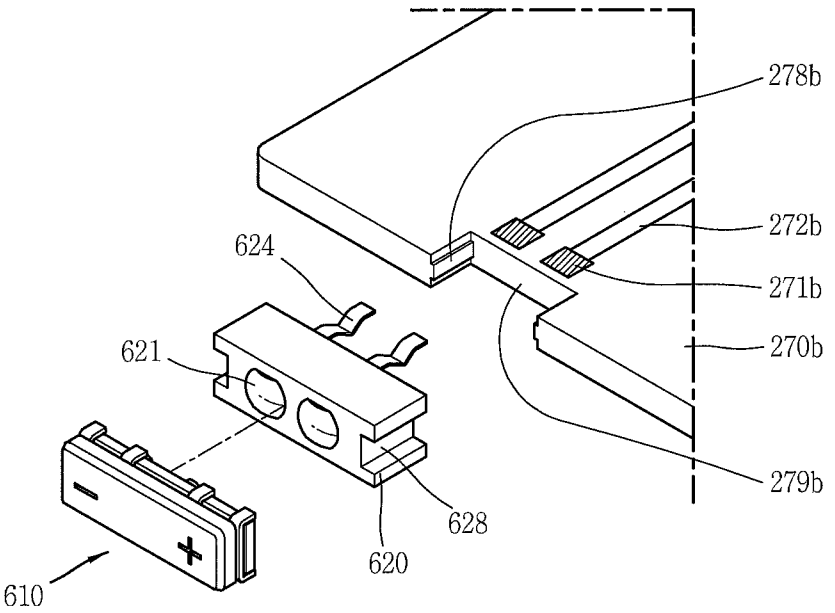


FIG. 12a

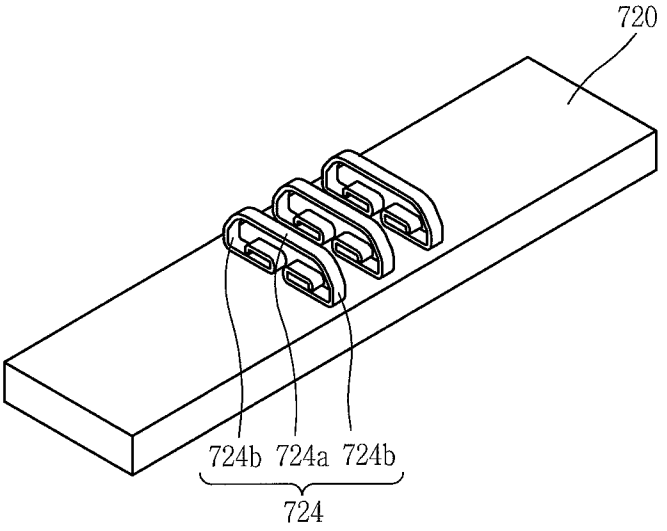


FIG. 12b

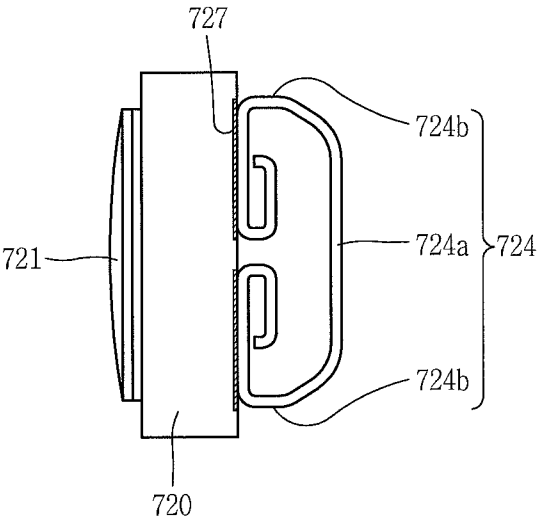


FIG. 13a

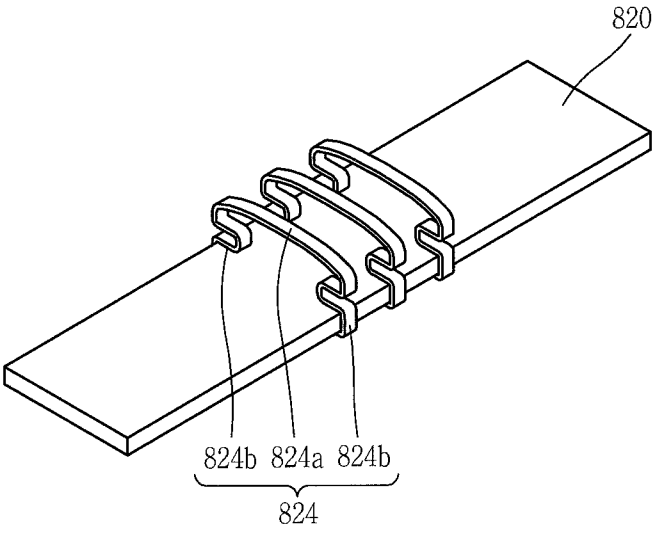


FIG. 13b

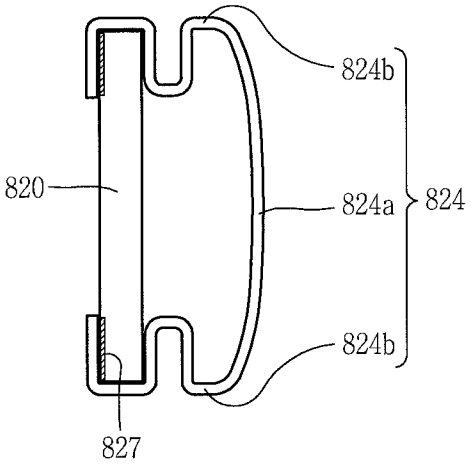


FIG. 14a

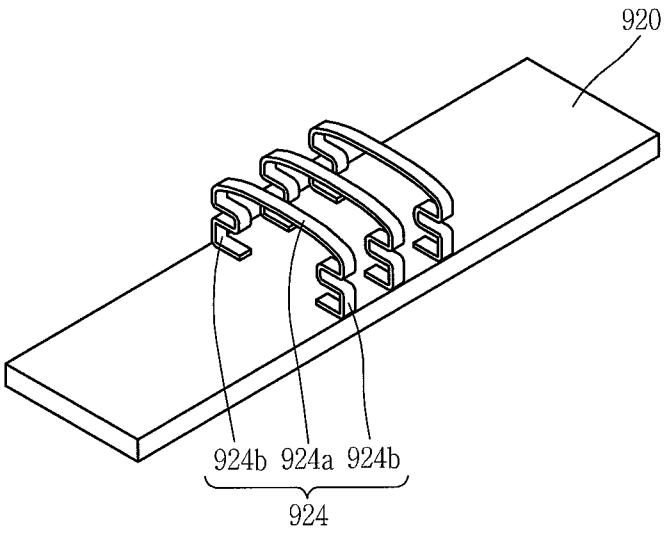


FIG. 14b

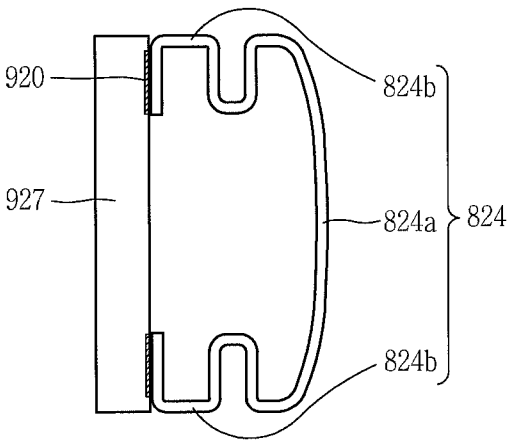
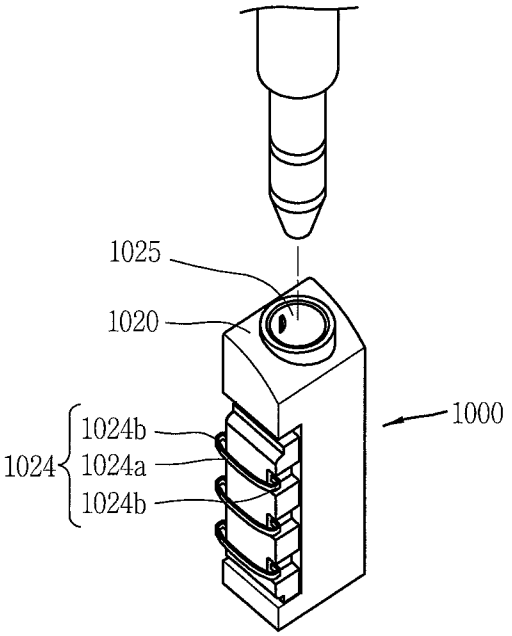


FIG. 15


1025
1020
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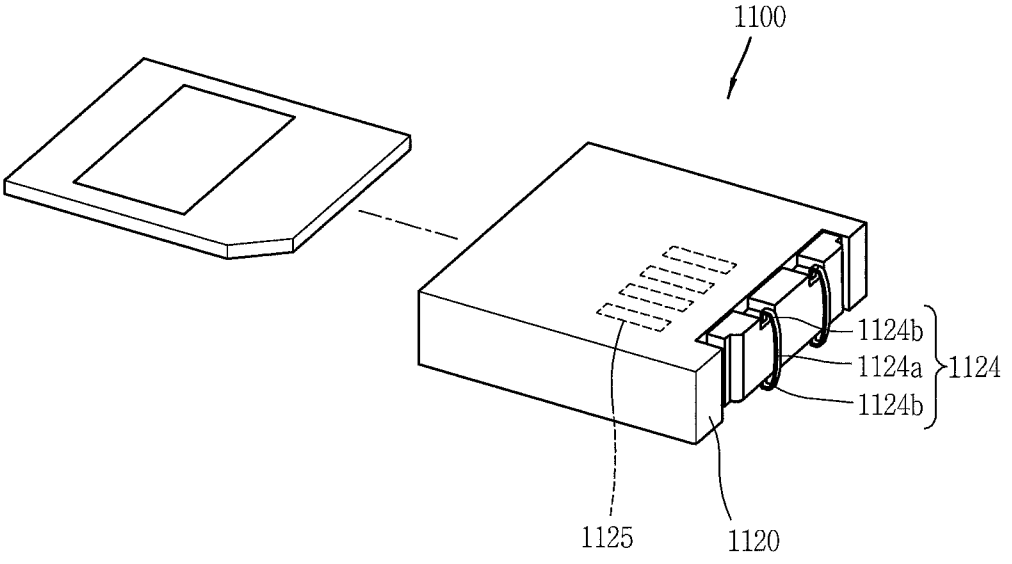
1024
1024b
1024a
1024b

FIG. 16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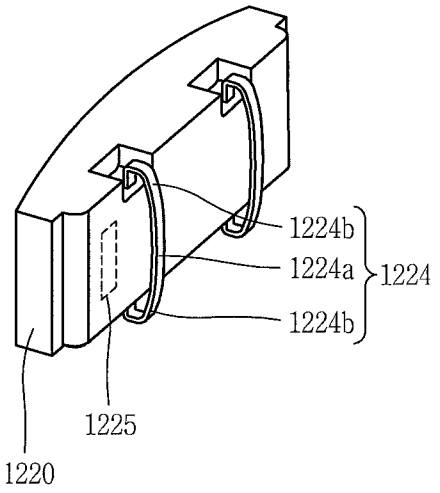
1124b
1124a
1124
1124b
1125
1120

FIG. 17



CONNECTION MODULE AND MOBILE TERMINAL HAVING THE SAME

CROSS-REFERENCE TO RELATED APPLICATION(S)

Pursuant to 35 U.S.C. §119(a), this application claims the benefit of earlier filing date and right of priority to Korean Application No. 10-2013-0028230, filed on Mar. 15, 2013, the contents of which is incorporated by reference herein in its entirety.

BACKGROUND

1. Field

The present disclosure relates to a connection module that is mounted on a terminal and electrically connects structures adjacent to one another and a mobile terminal having the same.

2. Background

As a mobile terminal becomes multifunctional, the mobile terminal can be allowed to capture still images or moving images, play music or video files, play games, receive broadcast, etc., so as to be implemented as an integrated multimedia player.

Terminals can be divided into mobile/portable terminals and stationary terminals according to their mobility. The mobile terminal is a portable device that can be carried anywhere and have one or more of a function of performing voice and video calls, a function of inputting/outputting information, a function of storing data, etc.

In order to support and enhance such functions of the terminal, it can be considered to improve the configuration and/or software of the terminal.

Particularly, connection modules are modules that electrically connect an external device to structures within a terminal. Examples of the connection modules may include an earjack for connecting an external sound output device, such as an earphone, to equipment inside a terminal, a socket for electrically connecting an external interface to internal equipment, or a power key.

A connection module has to be of a predetermined size to be fixed to a terminal and requires a separate fixation structure, which is a limitation in the design of the terminal. Moreover, due to the connection structure between the connection module for transmitting signals and the interior of the terminal, the terminal is required to have a space, which goes against the miniaturization of terminals. In addition, when mounting the connection module to the terminal, an increase in the number of assembly processes may lower the productivity of the terminal. Accordingly, a connection module having a new structure may be taken into consideration.

SUMMARY OF THE INVENTION

Therefore, an aspect of the detailed description is to provide a connection module of a mobile terminal which has a different structure from conventional ones.

Another aspect of the detailed description is to provide a connection module which has an enhanced connection structure and becomes smaller.

To achieve these and other advantages and in accordance with the purpose of this specification, as embodied and broadly described herein, there is provided a connecting module according to an embodiment of the present invention, the connecting module including: a body with conductive contact points formed on one surface; and a connecting terminal that is formed to be exposed to the other surface of the body and electrically connected to the conductive contact points, the connecting terminal including: a deformation portion that is elastically deformed in a direction toward or away from the body; and first and second support portions that are respectively formed on both sides of the deformation portion to support the deformation portion and integrally attached to the body.

According to an embodiment related to the present invention, the deformation portion may extend from the first support portion to the second support portion to have a predetermined curvature.

According to an embodiment related to the present invention, the body may include a board that is electrically connected to the conductive contact points.

According to an embodiment related to the present invention, the connecting terminal may be electrically connected to the board.

According to an embodiment related to the present invention, the first and second support portions may be attached to the board so as to cover both sides in the thickness direction of the board.

According to an embodiment related to the present invention, the connecting terminal may be fixed to the board by soldering.

To achieve these and other advantages and in accordance with the purpose of this specification, as embodied and broadly described herein, there is provided a mobile terminal according to another embodiment of the present invention, the mobile terminal including: a terminal body; and a key module mounted on the terminal body, the key module including: a key body; a dome portion that generates a signal by pressing the key body; and a connecting terminal that is attached to the dome portion, the connecting terminal including: a deformation portion that is elastically deformed in a direction toward or away from the body; and first and second support portions that are respectively formed on both sides of the deformation portion to support the deformation portion and integrally attached to the body.

According to an embodiment related to the present invention, the dome portion may include attaching portions that extend in the length direction of the terminal body; and the attaching portions may be inserted into grooves formed in the terminal body.

According to an embodiment related to the present invention, the connecting terminal may be in contact with a contact portion of the circuit board facing the connecting terminal so as to transmit a signal to the circuit board embedded in the terminal body.

According to an embodiment related to the present invention, the connecting terminal may be a conductive terminal that is elastically deformable when in contact with the contact portion.

According to an embodiment related to the present invention, the contact portion may be formed in an accommodating portion that supports the dome portion on the side of the terminal body.

According to an embodiment related to the present invention, the contact portion may be formed on one side surface of the circuit board.

According to an embodiment related to the present invention, the contact portion may be attached to the circuit board.

According to an embodiment related to the present invention, the circuit board may further include a recessed portion that is recessed inward from one side surface, and the dome portion may be inserted into the recessed portion.

According to an embodiment related to the present invention, the dome portion may be attached to the circuit board by fastening means that penetrates through the circuit board and the dome portion.

According to an embodiment related to the present invention, the dome portion may include an inwardly recessed insert portion, and the circuit board may be inserted into the insert portion.

According to an embodiment related to the present invention, the deformation portion may extend from the first support portion to the second support portion to have a predetermined curvature.

According to an embodiment related to the present invention, an actuator may be formed on the rear surface of the key body to press the dome.

According to an embodiment related to the present invention, the key body may include: a manipulating portion that forms the outer appearance of the key body; a pressure portion that is attached to the manipulating portion, has an actuator formed on the rear surface, and is formed integrally with the dome portion; and a support portion that supports the pressure portion.

According to an embodiment related to the present invention, the dome portion may further include a separation member that protrudes toward the pressure portion from one surface of the dome portion so as to separate the dome from the actuator by a predetermined gap.

BRIEF DESCRIPTION OF THE DRAWINGS

The embodiments will be described in detail with reference to the following drawings in which like reference numerals refer to like elements wherein:

FIG. **1** is a block diagram of a mobile terminal according to an example of the present invention;

FIG. **2** is a front perspective view of a mobile terminal according to an embodiment of the present invention;

FIG. **3** is a rear perspective view of the mobile terminal;

FIG. **4** is a perspective view of the mobile terminal of FIG. **3** from which a battery case is removed;

FIG. **5** is a view illustrating a key module according to a comparative example;

FIG. **6***a* is a conceptual diagram illustrating a key module according to an embodiment of the present invention, and FIGS. **6***b* and **6***c* are a rear perspective view and an exploded perspective view, respectively, of the key module shown in FIG. **6***a;*

FIG. **7***a* illustrates an example where the key module of FIG. **6***a* is connected to the circuit board, and FIG. **7***b* is a view illustrating an example where the key module is mounted on the terminal body;

FIGS. **8***a* and **8***b* are conceptual diagrams illustrating a modified example of the connecting terminal formed on the rear surface of the dome portion;

FIG. **9** is a conceptual diagram illustrating a modified example of contact portions formed on the circuit board;

FIGS. **10***a* to **10***c* are cross-sectional views taken along line V-V of FIG. **2** according to comparative examples and an embodiment, and FIG. **10***d* is a view illustrating the connecting terminal and the circuit board being in contact with each other;

FIGS. **11***a* to **11***c* are conceptual diagrams illustrating examples of the dome portion attached to the circuit board according to another embodiment of the present invention;

FIGS. **12***a* and **12***b* are a perspective view and a cross-sectional view illustrating a first example of a connecting terminal having an up-down symmetrical structure;

FIGS. **13***a* and **13***b* are a perspective view and a cross-sectional view illustrating a second example of a connecting terminal having an up-down symmetrical structure;

FIGS. **14***a* and **14***b* are a perspective view and a cross-sectional view illustrating a third example of a connecting terminal having an up-down symmetrical structure; and

FIGS. **15** to **17** are conceptual diagrams illustrating examples of a connecting module having a connecting terminal according to embodiments of the present invention.

DETAILED DESCRIPTION

Description will now be given in detail of the exemplary embodiments, with reference to the accompanying drawings. For the sake of brief description with reference to the drawings, the same or equivalent components will be provided with the same reference numbers, and description thereof will not be repeated. Singular expressions include plural expressions which do not have any obviously different meaning in view of a context.

A mobile terminal according to the present invention may include a portable phone, a smart phone, a laptop computer, a digital broadcasting terminal, Personal Digital Assistants (PDA), Portable Multimedia Player (PMP), a navigation system, etc. However, it will be obvious to those skilled in the art that the present invention may be also applicable to a fixed terminal such as a digital TV and a desktop computer.

FIG. **1** is a block diagram of a mobile terminal **100** according to an embodiment of the present invention.

The mobile terminal **100** may comprise components, such as a wireless communication unit **110**, an Audio/Video (A/V) input unit **120**, a user input unit **130**, a sensing unit **140**, an output module **150**, a memory **160**, an interface unit **170**, a controller **180**, a power supply unit **190**, and the like. FIG. **1** shows the mobile terminal **100** having various components, but it is understood that implementing all of the illustrated components is not a requirement. Greater or fewer components may alternatively be implemented.

Hereinafter, each component is described in sequence.

The wireless communication unit **110** may typically include one or more components which permit wireless communications between the mobile terminal **100** and a wireless communication system or between the mobile terminal **100** and a network within which the mobile terminal **100** is located. For example, the wireless communication unit **110** may include a broadcast receiving module **111**, a mobile communication module **112**, a wireless internet module **113**, a short-range communication module **114**, a location information module **115** and the like.

The broadcast receiving module **111** receives broadcast signals and/or broadcast associated information from an external broadcast management server (or other network entity) via a broadcast channel.

The broadcast channel may include a satellite channel and/or a terrestrial channel. The broadcast management server may be a server that generates and transmits a broadcast signal and/or broadcast associated information or a server that receives a previously generated broadcast signal and/or broadcast associated information and transmits the same to a terminal. The broadcast associated information may refer to information associated with a broadcast channel, a broadcast program or a broadcast service provider. The broadcast signal may include a TV broadcast signal, a radio broadcast signal, a data broadcast signal, and the like. Also, the broadcast signal may further include a broadcast signal combined with a TV or radio broadcast signal.

The broadcast associated information may also be provided via a mobile communication network and, in this case, the broadcast associated information may be received by the mobile communication module **112**.

The broadcast signal may exist in various forms. For example, it may exist in the form of an electronic program guide (EPG) of digital multimedia broadcasting (DMB), electronic service guide (ESG) of digital video broadcast-handheld (DVB-H), and the like.

The broadcast receiving module **111** may be configured to receive signals broadcast by using various types of broadcast systems. In particular, the broadcast receiving module **111** may receive a digital broadcast by using a digital broadcast system such as multimedia broadcasting-terrestrial (DMB-T), digital multimedia broadcasting-satellite (DMB-S), digital video broadcast-handheld (DVB-H), the data broadcasting system known as media forward link only (MediaFLO®), integrated services digital broadcast-terrestrial (ISDB-T), etc. The broadcast receiving module **111** may be configured to be suitable for every broadcast system that provides a broadcast signal as well as the above-mentioned digital broadcast systems.

Broadcasting signals and/or broadcasting associated information received through the broadcast receiving module **111** may be stored in the memory **160**.

The mobile communication module **112** transmits/receives wireless signals to/from at least one of network entities (e.g., base station, an external terminal, a server, etc.) on a mobile communication network. Here, the wireless signals may include audio call signal, video call signal, or various formats of data according to transmission/reception of text/multimedia messages.

The wireless internet module **113** supports wireless Internet access for the mobile terminal. This module may be internally or externally coupled to the mobile terminal **100**. Examples of such wireless Internet access may include Wireless LAN (WLAN) (Wi-Fi), Wireless Broadband (Wibro), World Interoperability for Microwave Access (Wimax), High Speed Downlink Packet Access (HSDPA), and the like.

The short-range communication module **114** denotes a module for short-range communications. Suitable technologies for implementing this module may include BLUETOOTH, Radio Frequency IDentification (RFID), Infrared Data Association (IrDA), Ultra-WideBand (UWB), ZigBee, and the like.

The location information module **115** denotes a module for sensing or calculating a position of a mobile terminal. An example of the location information module **115** may include a Global Position System (GPS) module.

Referring to FIG. **1**, the A/V input unit **120** is configured to receive an audio or video signal. The A/V input unit **120** may include a camera **121**, a microphone **122** or the like. The camera **121** processes image frames such as still images or moving images acquired by an image sensor in a video call mode or an image capturing mode. The processed image frames may be displayed on a display unit **151**.

The image frames processed by the camera **121** may be stored in the memory **160** or transmitted to the outside via the wireless communication unit **110**. Two or more cameras **121** may be provided according to the configuration of the mobile terminal.

The microphone **122** may receive sounds (audible data) via a microphone in a phone call mode, a recording mode, a voice recognition mode, and the like, and can process such sounds into audio data. The processed audio (voice) data may be converted for output into a format transmittable to a mobile communication base station via the mobile communication module **112** in case of the phone call mode. The microphone **122** may implement various types of noise canceling (or suppression) algorithms to cancel (or suppress) noise or interference generated while receiving and transmitting audio signals.

The user input unit **130** may generate input data for allowing a user to control various operations of the mobile communication terminal. The user input unit **130** may include a keypad, a dome switch, a touch pad (e.g., a touch sensitive member that detects changes in resistance, pressure, capacitance, etc. due to being contacted) a jog wheel, a jog switch, and the like.

The sensing unit **140** detects a current status (or state) of the mobile terminal **100** such as an opened or closed state of the mobile terminal **100**, a location of the mobile terminal **100**, the presence or absence of user contact with the mobile terminal **100** (e.g., touch inputs), the orientation of the mobile terminal **100**, an acceleration or deceleration movement and direction of the mobile terminal **100**, etc., and generates commands or signals for controlling the operation of the mobile terminal **100**. For example, when the mobile terminal **100** is implemented as a slide type mobile phone, the sensing unit **140** may sense whether the slide phone is open or closed. In addition, the sensing unit **140** can detect whether or not the power supply unit **190** supplies power or whether or not the interface unit **170** is coupled with an external device. The sensing unit **140** may include a proximity sensor **141**.

The output unit **150** is configured to provide outputs in a visual, audible, and/or tactile manner. The output unit **150** may include the display unit **151**, an audio output module **152**, an alarm unit **153**, a haptic module **154**, and the like.

The display unit **151** may display information processed in the mobile terminal **100**. For example, when the mobile terminal **100** is in a phone call mode, the display unit **151** may display a User Interface (UI) or a Graphic User Interface (GUI) associated with a call. When the mobile terminal **100** is in a video call mode or image capturing mode, the display unit **151** may display a captured image and/or received image, or a UI or GUI.

The display unit **151** may include at least one of a Liquid Crystal Display (LCD), a Thin Film Transistor-LCD (TFT-LCD), an Organic Light Emitting Diode (OLED) display, a flexible display, a three-dimensional (3D) display, or the like.

Some of these displays may be configured to be transparent so that outside may be seen therethrough, which may be referred to as a transparent display. A representative example of the transparent display may include a Transparent Organic Light Emitting Diode (TOLED), and the like. The rear surface portion of the display unit **151** may also be implemented to be optically transparent. Under this configuration, a user can view an object positioned at a rear side of a body through a region occupied by the display unit **151** of the body.

The display unit **151** may be implemented in two or more in number according to a configured aspect of the mobile terminal **100**. For instance, a plurality of displays may be arranged on one surface integrally or separately, or may be arranged on different surfaces.

Here, if the display unit **151** and a touch sensitive sensor (referred to as a touch sensor) have a layered structure therebetween, the structure may be referred to as a touch screen. The display unit **151** may be used as an input device

rather than an output device. The touch sensor may be implemented as a touch film, a touch sheet, a touch pad, and the like.

The touch sensor may be configured to convert changes of a pressure applied to a specific part of the display unit **151**, or capacitance occurring from a specific part of the display unit **151**, into electric input signals. Also, the touch sensor may be configured to sense not only a touched position and a touched area, but also a touch pressure.

When touch inputs are sensed by the touch sensors, corresponding signals are transmitted to a touch controller (not shown). The touch controller processes the received signals, and then transmits corresponding data to the controller **180**. Accordingly, the controller **180** may sense which region of the display unit **151** has been touched.

Referring to FIG. **1**, a proximity sensor **141** may be arranged at an inner region of the mobile terminal blocked by the touch screen, or near the touch screen. The proximity sensor **141** indicates a sensor to sense presence or absence of an object approaching to a surface to be sensed, or an object disposed near a surface to be sensed, by using an electromagnetic field or infrared rays without a mechanical contact. The proximity sensor **141** has a longer lifespan and a more enhanced utility than a contact sensor.

The proximity sensor **141** may include a transmissive type photoelectric sensor, a direct reflective type photoelectric sensor, a mirror reflective type photoelectric sensor, a high-frequency oscillation proximity sensor, capacitance type proximity sensor, a magnetic type proximity sensor, an infrared rays proximity sensor, and so on. When the touch screen is implemented as capacitance type, proximity of a pointer to the touch screen is sensed by changes of an electromagnetic field. In this case, the touch screen (touch sensor) may be categorized into a proximity sensor.

Hereinafter, for the sake of brief explanation, a status that the pointer is positioned to be proximate onto the touch screen without contact will be referred to as 'proximity touch', whereas a status that the pointer substantially comes in contact with the touch screen will be referred to as 'contact touch'. For the position corresponding to the proximity touch of the pointer on the touch screen, such position corresponds to a position where the pointer faces perpendicular to the touch screen upon the proximity touch of the pointer.

The proximity sensor **141** senses proximity touch, and proximity touch patterns (e.g., distance, direction, speed, time, position, moving status, etc.). Information relating to the sensed proximity touch and the sensed proximity touch patterns may be output onto the touch screen.

The audio output module **152** may convert and output as sound audio data received from the wireless communication unit **110** or stored in the memory **160** in a call signal reception mode, a call mode, a record mode, a voice recognition mode, a broadcast reception mode, and the like. Also, the audio output module **152** may provide audible outputs related to a particular function performed by the mobile terminal **100** (e.g., a call signal reception sound, a message reception sound, etc.). The audio output module **152** may include a speaker, a buzzer, and so on.

The alarm unit **153** may provide outputs to inform about the occurrence of an event of the mobile terminal **100**. Typical events may include call reception, message reception, key signal inputs, a touch input, etc. In addition to audio or video outputs, the alarm unit **153** may provide outputs in a different manner to inform about the occurrence of an event. The video signal or the audio signal may be output via the display unit **151** or the audio output module **152**. Accordingly, the display unit **151** or the audio output module **152** may be classified as part of the alarm unit **153**.

The haptic module **154** generates various tactile effects which a user can feel. A representative example of the tactile effects generated by the haptic module **154** includes vibration. Vibration generated by the haptic module **154** may have a controllable intensity, a controllable pattern, and so on. For instance, different vibration may be output in a synthesized manner or in a sequential manner.

The haptic module **154** may generate various tactile effects, including not only vibration, but also arrangement of pins vertically moving with respect to a skin being touched (contacted), air injection force or air suction force through an injection hole or a suction hole, touch by a skin surface, presence or absence of contact with an electrode, effects by stimulus such as an electrostatic force, reproduction of cold or hot feeling using a heat absorbing device or a heat emitting device, and the like.

The haptic module **154** may be configured to transmit tactile effects (signals) through a user's direct contact, or a user's muscular sense using a finger or a hand. The haptic module **154** may be implemented in two or more in number according to the configuration of the mobile terminal **100**.

The memory **160** may store a program for the processing and control of the controller **180**. Alternatively, the memory **160** may temporarily store input/output data (e.g., phonebook data, messages, still images, video and the like). Also, the memory **160** may store data relating to various patterns of vibrations and audio output upon the touch input on the touch screen.

The memory **160** may be implemented using any type of suitable storage medium including a flash memory type, a hard disk type, a multimedia card micro type, a memory card type (e.g., SD or DX memory), Random Access Memory (RAM), Static Random Access Memory (SRAM), Read-Only Memory (ROM), Electrically Erasable Programmable Read-only Memory (EEPROM), Programmable Read-only Memory (PROM), magnetic memory, magnetic disk, optical disk, and the like. Also, the mobile terminal **100** may operate a web storage which performs the storage function of the memory **160** on the Internet.

The interface unit **170** may generally be implemented to interface the mobile terminal with external devices. The interface unit **170** may allow a data reception from an external device, a power delivery to each component in the mobile terminal **100**, or a data transmission from the mobile terminal **100** to an external device. The interface unit **170** may include, for example, wired/wireless headset ports, external charger ports, wired/wireless data ports, memory card ports, ports for coupling devices having an identification module, audio Input/Output (I/O) ports, video I/O ports, earphone ports, and the like.

The identification module may be configured as a chip for storing various information required to authenticate an authority to use the mobile terminal **100**, which may include a User Identity Module (UIM), a Subscriber Identity Module (SIM), a Universal Subscriber Identity Module (USIM), and the like. Also, the device having the identification module (hereinafter, referred to as 'identification device') may be implemented in a type of smart card. Hence, the identification device can be coupled to the mobile terminal **100** via a port.

Also, the interface unit **170** may serve as a path for power to be supplied from an external cradle to the mobile terminal **100** when the mobile terminal **100** is connected to the external cradle or as a path for transferring various command signals inputted from the cradle by a user to the mobile

terminal **100**. Such various command signals or power inputted from the cradle may operate as signals for recognizing that the mobile terminal **100** has accurately been mounted to the cradle.

The controller **180** typically controls the overall operations of the mobile terminal **100**. For example, the controller **180** performs the control and processing associated with telephony calls, data communications, video calls, and the like. The controller **180** may include a multimedia module **181** which provides multimedia playback. The multimedia module **181** may be configured as part of the controller **180** or as a separate component.

The controller **180** can perform a pattern recognition processing so as to recognize writing or drawing input on the touch screen as text or image.

The power supply unit **190** serves to supply power to each component by receiving external power or internal power under control of the controller **180**.

Various embodiments described herein may be implemented in a computer-readable medium using, for example, software, hardware, or some combination thereof.

For a hardware implementation, the embodiments described herein may be implemented within one or more of Application Specific Integrated Circuits (ASICs), Digital Signal Processors (DSPs), Digital Signal Processing Devices (DSPDs), Programmable Logic Devices (PLDs), Field Programmable Gate Arrays (FPGAs), processors, controllers, micro-controllers, micro processors, other electronic units designed to perform the functions described herein, or a selective combination thereof. In some cases, such embodiments are implemented by the controller **180**.

For software implementation, the embodiments such as procedures and functions may be implemented together with separate software modules each of which performs at least one of functions and operations. The software codes can be implemented with a software application written in any suitable programming language. Also, the software codes may be stored in the memory **160** and executed by the controller **180**.

FIG. **2** is a front perspective view of a mobile terminal according to the present invention, and FIG. **3** is a rear perspective view of the mobile terminal of FIG. **2**.

Referring to FIGS. **2** and **3**, the mobile terminal **200** according to the present invention is provided with a bar type terminal body. However, the present invention is not limited to this, but may be applied to a slide type in which two or more bodies are coupled to each other so as to perform a relative motion, a folder type, a swing type, and the like. Further, the mobile terminal of the present invention may be applied to any portable electronic device having a camera and a flash, for instance, a portable phone, a smart phone, a notebook computer, a digital broadcasting terminal, Personal Digital Assistants (PDAs), Portable Multimedia Players (PMO), etc.

The mobile terminal **200** includes a terminal body **204** which forms the appearance thereof. A case (casing, housing, cover, etc.) which forms the appearance of the terminal body **204** may include a front case **201**, a rear case **202**, and a battery cover **203** for covering the rear surface of the rear case **202**.

A space formed by the front case **201** and the rear case **202** may accommodate various components therein. Such cases may be formed by injection-molded synthetic resin, or may be formed using a metallic material such as stainless steel (STS) or titanium (Ti).

On the front surface of the terminal body **204**, may be disposed a display unit **210**, a first audio output unit **211**, a front camera **216**, a side key **214**, an interface unit **215**, and a signal input unit **217**.

The display unit **210** includes a liquid crystal display (LCD) module, organic light emitting diodes (OLED) module, e-paper, etc., each for visually displaying information. The display unit **210** may include a touch sensing means for inputting information in a touch manner.

The display unit **210** includes a window **210***a* (refer to FIG. **8**) and a display module **210***b*. Hereinafter, the window **210***a* including a touch sensing means is called 'touch screen'. Once part on the touch screen **210***a* is touched, content corresponding to the touched position is input. The content input in a touch manner, may be characters, or numbers, or menu items which can be set in each mode. The touch sensing means may be transmissive so that the display can be viewed, and may include a structure for enhancing visibility of the touch screen at a bright place. Referring to FIG. **2**, the touch screen **210***a* occupies most of the front surface of the front case **201**.

The first audio output unit **211** may be implemented as a receiver for transmitting a call sound to a user's ear, or a loud speaker for outputting each type of alarm sound or a playback sound of multimedia.

The front camera **216** processes image frames such as still images or moving images, acquired by an image sensor in a video call mode or a capturing mode. The processed image frames may be displayed on the display unit **210**.

The image frames processed by the front camera **216** may be stored in the memory **160**, or may be transmitted to the outside through the wireless communication unit **110**. The front camera **216** may be implemented in two or more according to a user's interface.

The user input unit **217** is manipulated to receive a command for controlling the operation of the mobile terminal **200**, and may include a plurality of input keys. The input keys may be referred to as manipulation portions, and may include any type of ones that can be manipulated in a user's tactile manner.

For instance, the user input unit **217** may be implemented as a dome switch, or a touch screen, or a touch pad for inputting commands or information in a user's push or touch manner. Alternatively, the user input unit **217** may be implemented, for example, as a wheel for rotating a key, a jog, or a joystick. The user input unit **217** is configured to input various commands such as START, END and SCROLL.

A side key **214**, an interface unit **215**, an audio input unit **213**, etc. are disposed on the side surface of the front case **201**.

The side key **214** may be called 'manipulation unit', and may be configured to receive commands for controlling the operation of the mobile terminal **200**. The side key **214** may include any type of ones that can be manipulated in a user's tactile manner. Content input by the side key **214** may be variously set. For instance, through the side key **214**, may be input commands such as controlling the front camera **216** and a rear camera **221**, controlling the level of sound output from the audio output unit **211**, and converting a current mode of the display unit **210** into a touch recognition mode.

The audio output unit **213** may be implemented as a microphone for receiving a user's voice, other sound, etc.

The interface unit **215** serves a path through which the mobile terminal **200** performs data exchange, etc. with an external device. For example, the interface unit **215** may be at least one of a connection terminal through which the

mobile terminal **200** is connected to an ear phone by cable or radio, a port for local area communication, e.g., an infrared data association (IrDA) port, a Bluetooth portion, a wireless LAN port, and power supply terminals for supplying power to the mobile terminal **200**. The interface unit **215** may be a card socket for accommodating an external card such as a subscriber identification module (SIM) card, a user identity module (UIM) card or a memory card for storing information.

A power supply unit **240** and the rear camera **221** are disposed on the rear surface of the body **204**.

A flash **222** and a mirror (not shown) may be disposed close to the rear camera **221**. When capturing an object by using the rear camera **221**, the flash **222** provides light onto the object.

When the user captures an image of himself/herself by using the rear camera **221**, the mirror can be used for the user to look at himself/herself therein.

The rear camera **221** may face a direction which is opposite to a direction faced by the front camera **216**, and may have different pixels from those of the front camera **216**.

For example, the front camera **216** may operate with relatively lower pixels (lower resolution). Thus, the front camera **216** may be useful when a user can capture his face and send it to another party during a video call or the like. On the other hand, the rear camera **221** may operate with a relatively higher pixels (higher resolution) such that it can be useful for a user to obtain higher quality pictures for later use. The front camera **216** and the rear camera **221** may be installed at the terminal body **204** so as to rotate or pop-up.

The power supply unit **240** is configured to supply power to the mobile terminal **200**. The power supply unit **240** may be mounted in the terminal body **204**, or may be detachably mounted to the terminal body **204**.

FIG. **4** is a perspective view of the mobile terminal of FIG. **3** from which a battery case is removed. FIG. **5** is a conceptual diagram of a frame according to an embodiment of the present invention. FIG. **6** is a conceptual diagram of the frame to which a signal input module is attached.

Referring to FIG. **4**, a circuit board **270** is arranged in an inner space of a terminal body **204** including a front case **201** and a rear case **202**. The circuit board **270** may be mounted on the rear case **202**, as shown in the drawing, or mounted on a separate internal structure. The circuit board **270** may be configured as an exemplary controller for operating a variety of functions of the mobile terminal.

An antenna device **250** for emitting radio signals may be arranged in the inner space of the terminal body **204**.

A socket **240**, which is electrically connected to the circuit board **270** and allows access to external devices is arranged in the inner space of the terminal body **204**.

An example of the external devices to be inserted into the socket **240** may include a SIM card. A SIM card (Scriber Identify Module card) refers to a card capable of storing personal information. Besides, memory cards like T-Flash cards, which are commonly referred to as micro-SD cards, and chips for modems like MSM chips (Mobile Station Modem chips) may be inserted.

Also, other external devices, including interface devices for charging, such as an Multimedia Interface Connector (MMI Connector), for calling, such as an earphone, and for data cable ports, may be inserted into the socket **240**.

FIG. **5** is a view illustrating a key module according to a comparative example. FIG. **6***a* is a conceptual diagram illustrating a key module according to an embodiment of the present invention, and FIGS. **6***b* and **6***c* are a rear perspective view and an exploded perspective view, respectively, of the key module shown in FIG. **6***a*.

Referring to FIG. **5**, the key module **214** according to the comparative example includes a key body **214***a* and a dome portion **214***b*. An actuator **214***d* is formed on the rear surface of the key body **214***a*, and the actuator **214***d* presses a dome **214***c* of the dome portion **214***b* facing it by a user's pressing action. The pressed dome **214***c* is elastically deformed by the actuator **214***d* and electrically connects two contact points **214***g* and **214***f* formed on one surface of the deformed dome portion **214***b*, thereby issuing a signal.

The dome portion **214***b* is connected to a flexible circuit board **214***e*, and the flexible circuit board **214***e* is connected all the way to the circuit board embedded in the terminal body. That is, one end of the flexible circuit board **214***e* is connected to the dome portion **214***b*, and the other end is connected to the circuit board. Due to this, the signal generated by the user's pressing the key body **214***a* is transmitted to the circuit board through the dome portion **214***b* and the flexible circuit board **214***e*.

To configure the key module **214** in this way, an assembly process is required to connect the flexible circuit board **214***e* connected to the dome portion **214***b* to the circuit board mounted within the main body. Also, separate connecting means is required to connect the ends of the flexible circuit board **214***e* to the key module **214** and the circuit board, respectively. Moreover, a space is required because the flexible circuit board **214***e* has to be installed within the terminal, avoiding interference with other parts. The space occupied by the flexible circuit board **214***e* becomes a factor that makes it difficult to optimize the arrangement of parts in the terminal. In addition, an additional process for assembling the flexible circuit board **214***e* to the mobile terminal becomes a factor that reduces efficiency in the manufacture of terminals.

The key module **300** according to the present invention presents more efficient means of connecting to the circuit board **270**. Due to this, the assembly process can be simplified, and the key module **300** can be mounted on the terminal body **204** within narrower space.

Referring to FIGS. **6***a* to **6***c*, the key module **300** according to the present invention uses a connecting terminal **324** to connect to the circuit board **270**. As the connecting terminal **324** is provided on the key module **300**, such a structure as the flexible circuit board can be omitted, which can simplify the assembly process.

In this case, a contact portion **271** (see FIG. **7***a*) may be formed between the connecting terminal **324** and the circuit board **270** (see FIG. **7***a*). Also, the contact portion **271** and the circuit board **270** are electrically connected.

The connecting terminal **324** is elastically deformed when in contact with the contact portion **271**. That is, the connecting terminal **324**, an elastically deformable conductive terminal, comes into elastic contact with the contact portion **271**. Due to this, the connecting terminal **324** can maintain contact with the contact portion **271** while performing a buffering action against the impact on the terminal.

Referring to FIG. **6***b*, the upper and lower parts of the connecting terminal **324** are symmetrical with respect to the center. The connecting terminal **324** may include a deformation portion **324***a* and first and second support portions **324***b*. The deformation portion **324***a* may be elastically deformed in a direction toward or away from the dome portion **320**. Therefore, the deformation portion **324***a* and the contact portion may maintain elastic contact with each other. The first and second support portions **324***b* may be formed on both sides of the deformation portion **324***a*. The

first and second support portions **324***b* may elastically support the deformation portion **324***a*. According to an embodiment, at least one of the first and second support portions **324***b* may be inserted and fixed into the dome portion **320**.

In an example, the first and second support portions **324***b* may be inserted and fixed into the dome portion **320**. Also, any one of the support portions **324***b* may be electrically connected to conductive contact points **322** and **323** formed on the dome portion **320**, by which signals generated from the dome portion **320** can be transmitted to the contact portion **271** of the circuit board **270** through the connecting terminal **324**. In this case, the conductive contact points **322** and **323** and the support portion **324***b* may be connected together by a conductive pattern formed on the board.

The deformation portion **324***a* may extend from the first support portion to the second support portion to have a predetermined curvature. That is, the inner side of the deformation portion **324***a* that faces the dome portion **320** may be concave, and the outer side may be convex. The deformation portion **324***a* may be adapted in such a way that the upper and lower parts are symmetrical with respect to the center.

As such, the deformation portion **324***a* is elastically deformed in a direction toward or away from the dome portion **320** and supported by the support portion **324***b* so as to avoid deformation in an up-and-down direction. Therefore, the deformation portion **324***a* can make stable contact with the contact portion **271**, even upon impact.

Referring to FIGS. **6***a* to **6***c*, the key module **300** includes a key body **310** and a dome portion **320**. One surface (e.g., the front surface) of the key body **310** is exposed externally through the terminal body **204**, and indicators such as symbols, characters, diagrams, etc. that indicate the functions of the key may be formed on the exposed surface. An actuator **314** may be formed on the other surface (e.g., rear surface) of the key body **310**. The actuator **314** may be arranged to be in contact with the dome **321** formed at the dome portion **320**.

A first dome contact point **322** and a second dome contact point **323** are formed on one surface of the dome portion **320**, and when the dome **321** is pressed, the first dome contact point **322** and the second dome contact point **323** are electrically connected together by the dome **321**. Through this electrical connection, a signal is generated. The generated signal is transmitted to the circuit board **270** through the connecting terminal **324**.

A board of circuit board (PCB) type or flexible circuit board (FPCB) type may configure the body of the dome portion **320**.

The connecting terminal **324** is formed integrally with the dome portion **320**. In this case, part of the connecting terminal **324** has to be exposed to the rear surface of the dome portion **320** in order to be connected to the circuit board **270**. As a way of forming the connecting terminal **324** integrally with the dome portion **320**, the connecting terminal **324** may be inserted into the dome portion **320**, or the connecting terminal **324** may be attached to the rear surface of the dome portion **320**. As such, the exposed connecting terminal **324** and the circuit board **270** may be electrically connected together.

The connecting terminal **324** are elastically deformably formed and comes into elastic contact with the contact portion **271**, though it may be made from various materials in various shapes.

As shown in FIG. **6***b*, the connecting terminal **324** may be made of a conductor, for example, whose upper and lower parts are symmetrical.

Back to describing the key module **300**, the key module **300** has fixing portions **325** that extend in the length direction of the terminal body **304**. In an example, the fixing portions **325** may be formed on the dome portion **320**. Here, the fixing portions **325** are portions that protrude outward from both sides of the dome portion **320**. The fixing portions **325** of the dome portion **320** that protrude longitudinally may be inserted into grooves **201***d* (see FIG. **7***b*) formed in the terminal body **204**. By inserting the fixing portions **325** into the grooves **201***d*, the key module **300** may be fixed to the terminal body **204**.

Preferably, the fixing portions **325** extend in the length direction of the terminal body **204**. If the fixing portions **325** extend in the thickness direction of the terminal body **204**, this becomes a factor that increases the thickness of the terminal body **204**, posing an obstacle to slimming the terminal.

On the other hand, the fixing portions **325** may be formed not on the dome portion **320**, but on the key body **310**. In this case, only both side edges of the key module **300** are fixed to the terminal body **204**, so that a key support portion **312** may be included in the key module **300** to keep the center area of the key module **300** from hanging down. In an example, a hard metal frame, as the key support portion **312**, may be included in the key module **300**.

Moreover, the key support portion **312** may be formed to support the key body **310**, in order to keep the center area of the key body **310** from hanging down when pressed. In this case, the key support portion **3212** serves as a kind of support that supports the key body **210**.

When the key body **310** is pressed, the actuator **314** formed on the rear surface of the key body **310** presses the dome **321** formed on one surface of the dome portion **320**. When the key body **310** is not pressed, the rear surface of the key body **310** and one surface of the dome portion **320** must be separate from each other. To this end, a separation member **326** is formed on one surface of the dome portion **320**. The separation member **326** protrudes toward the key body **310**. In contrast, the separation member **326** may be formed on the rear surface of the key body **310** that faces the dome portion **320**.

If the dome portion **320** and the key body **310** are formed integrally, one surface of the separation member **326** is attached to the key body **310**. This attachment may be done with adhesive means such as double-sided tape or adhesive. Alternatively, the dome portion **320** and the key body **310** may be integrally fastened with a screw.

The aforementioned dome **321** and actuator **314** may be formed in plurality in number. The domes **321** and actuators **314** are configured to generate different signals. More specifically, one dome **321** and one actuator **314** generate one signal by input, and another dome **321** and another actuator **314** generate another signal by input. Therefore, a signal is generated from one dome **321** and one actuator **314** by input, and a different signal is generated from another dome **321** and another actuator **314** by input.

According to an embodiment, the key body **310** may include a plurality of elements. For example, the key body **310** may include a manipulating portion **311**, a pressure portion **313**, and a key support portion **312**. One surface of the manipulating portion **311** is exposed externally through the terminal body **204**, and indicators such as symbols, characters, diagrams, etc. that indicate the functions of the key may be formed on the exposed surface. The manipu-

lating portion **311** may be made from soft synthetic resin in order to increase sensitivity to user touch.

One surface of the pressure portion **313** is attached to the manipulating portion **311**, and the actuator **314** is formed on the other surface. A protruding projection **313***a* is formed on one surface of the pressure portion **313** which is to be attached to the manipulating portion **311**, and the projection **313***a* may extend to penetrate through the key support portion **312** and be attached to the manipulating portion **311**.

The key support portion **312** is formed to support the center area of the key module **300** in order to keep the center area of the key module **300** from hanging down. The key support portion **312** may be made of a hard frame having a predetermined rigidity.

In this manner, the manipulating portion **311**, pressure portion **313**, and key support portion **312** which constitute the key body **310** may be attached together and integrally formed. The integrally-formed key body **310** may be attached to the dome portion **320**.

FIG. **7***a* illustrates an example where the key module of FIG. **6***a* is connected to the circuit board, and FIG. **7***b* is a view illustrating an example where the key module is mounted on the terminal body.

As shown in FIG. **7***a*, the key module **300** may be formed so that the key body **310** and the dome portion **320** are integral with each other. The connecting terminal **324** is exposed to the rear surface of the dome portion **320**, and the exposed connecting terminal **324** is connected to the circuit board **270** so as to transmit signals to the circuit board **270**. The contact portion **271** is arranged between the connecting terminal **324** and the circuit board **270**. This allows signals from the key module **300** to be transmitted to the circuit board **270** through the connecting terminal **324** and the contact portion **271**. The contact portion **271** may be attached to the circuit board **270**, or printed in a conductive pattern on the circuit board **270**. Alternatively, a conductive member may be attached to the circuit board **270** and then connected to the conductive pattern.

The connecting terminal **324** and the contact portion **271** may be provided in plural number.

Also, a key control portion **273**, which is formed to process signals generated from the key module **300**, and the contact portion **271** may be connected by a conductive line **272**.

As shown in FIG. **7***b*, the key module **300** may be accommodated in an accommodating portion **201***b* formed in the terminal body **204**. A via hole **201***a* is formed in the case **201** of the terminal body **204** so as to expose one surface of the key module **300**, and one surface of the key module **300** is exposed through the via hole **201***a* when the key module **300** is accommodated in the accommodating portion **201***b*.

Moreover, the accommodating portion **201***b* guides the key module **300** so that the key module **300** is fixed to the terminal body **204**. Also, the accommodating portion **201***b* may have a hole **201***c* through which the connecting terminal **324** can come into direct contact with the contact portion **271** of the circuit board **270**. The connecting terminal **324** passes through the hole **201***c* and comes into direct contact with the contact portion **271**.

On the other hand, the accommodating portion **201***b* may fix only some part of the key module **300** while guiding it, and the connecting terminal **324** and the contact portion **271** may be directly connected as the key module **300** and the circuit board **270** face each other.

The grooves **201***d* corresponding to the fixing portions **325** of the key module **300** is formed in the accommodating portion **201***b*. The fixing portions **325** are inserted and fixed into the grooves **201***d*.

In addition, a contact portion (not shown) interconnecting the circuit board **270** and the key module **300** may be formed in the accommodating portion **201***b*. In this case, the connecting terminal **324** may be connected to the contact portion of the accommodating portion **201***b*, and the conductive pattern formed on the circuit board **270** may be connected to the contact portion of the accommodating portion **201***b*.

FIGS. **8***a* and **8***b* are conceptual diagrams illustrating a modified example of the connecting terminal formed on the rear surface of the dome portion.

As described above, the connecting terminal **324** is formed on the rear surface of the dome portion **320**. The connecting terminal **324** is formed to transmit signals generated from the dome portion **320** to the circuit board **270**. To this end, the connecting terminal **324** is positioned on the rear surface of the dome portion **320**, and adapted to be in contact with the contact portion **271** of the circuit board **270**. The connecting terminal **324** may be formed integrally with the dome portion **320**.

As shown in the drawings, the connecting terminal **324** may be made from various elastically deformable materials in various shapes. In an example, as shown in FIG. **8***a*, the connecting terminal **324'** may be made of a thin strip-shaped conductive member, and formed in such a way that the center area protrudes. The protruding center area is elastically deformed, and comes into contact with the contact portion **271** of the circuit board **270**.

In another example, as shown in FIG. **8***b*, the connecting terminal **324"** may be in the shape of a dome which is made of a conductive member. The center of the dome is elastically deformed, and comes into contact with the contact portion **271** of the circuit board **270**.

The foregoing embodiments of the present invention do not limit the shape of the connecting terminal **324**. However, the connecting terminal **324** may be formed in such a way as to be elastically deformed by applying pressure and bring some part into contact with the contact portion **271** of the circuit board **270**.

FIG. **9** is a conceptual diagram illustrating a modified example of contact portions formed on the circuit board.

The contact portion **271** may be formed in a conductive pattern on the side of the circuit board **270** that faces the connecting terminal **324**. However, if the circuit board **270** is thinned, it is difficult to form the contact portion **271** in a conductive pattern on the side of the circuit board **270**.

Accordingly, as shown in FIG. **9**, a contact portion **271***a* may be attached to the circuit board **270***a* after they are formed on a separate connecting portion **274***a*. If the contact portion **271***a* is formed on a separate connecting portion **274***a*, a conductive line **272***a* may be formed on one surface (the top, the bottom, or a side surface) of the circuit board **270***a* so that the circuit board **270***a* and the contact portion **271***a* are connected together. The connecting portion may have a conductive line **275***a* so that the contact portion **271***a* and the conductive line **272** are electrically connected together.

FIGS. **10***a* to **10***c* are cross-sectional views taken along line V-V of FIG. **2** according to comparative examples and an embodiment. FIG. **10***d* is a view illustrating the connecting terminal and the circuit board being in contact with each other.

According to the comparative example shown in FIG. **10***a*, the key body **214***a* constituting the key module **214** is attached to the case **201**. Of the key body **214***e*, fixing portions that protrude upward and downward are attached to the case **201**. Due to this, the size of the fixing portions **214***h* become a factor that increases the thickness dl of the key body **214***h*, and the key module **214** may cause an increase in the thickness h1 of the terminal. The dome portion **214***b* is attached and fixed to the structure within the terminal. Since the dome portion **214***b* and the circuit board **270** are connected by the flexible circuit board **214***e*, separate space is required to place the flexible circuit board **214***e* in it.

According to the embodiment of the present invention shown in FIG. **10***c*, the key module **300** is formed integrally and arranged in the accommodating portion **201***b*. The connecting terminal **324** penetrating through the via hole **201***a* of the accommodating portion **201***b* is attached to the contact portion **271** of the circuit board **270**.

A comparison of the comparative example and the embodiment of the present invention will be made. According to the present invention, the fixing portions **325** of the key module **300** are formed in the length direction of the terminal. Accordingly, the terminal can be made slimmer. Moreover, as long as the key body **310** and the dome portion **320** are formed integrally and the key module **300** is assembled in the accommodating portion, the key module **300** and the circuit board **270** can be connected together, thus simplifying the assembly process. Also, the key module **300** and the circuit board **270** are interconnected not by the flexible circuit board but by the connecting terminal **324**, and therefore space for the arrangement of the flexible circuit board is not required. As a result, the space within the terminal can be designed with more efficiency.

According to the comparative example shown in FIG. **10***b*, the connecting terminal **324'''** may be made of a conductor that is bent in V or U-shape. The connecting terminal of this shape may be twisted or bent from impact, and this may release the connection between the connecting terminal **324'''** and the contact portion of the circuit board **270**. Moreover, the assembly direction may be limited in the process of attaching the key module to the terminal body. That is, although the connecting terminal can be assembled in such a way that it is pushed up, if the connecting terminal is assembled in such a way that it is pushed down, the connecting terminal and the circuit board may interfere with each other and therefore the assembly direction may be limited.

As shown in FIG. **6***b* and FIG. **10***d*, since the upper and lower parts of the connecting terminal **324** according to the present invention are symmetrical, the assembly direction is not limited. Moreover, the connecting terminal can be prevented from being twisted or bent upon impact, and can make stable contact with the contact portion **271**.

Besides, as shown in FIG. **10***b*, the contact points and the connecting terminal can be electrically connected well even if the circuit board is not positioned at the center of the connecting terminal. That is, the contact state is maintained well even if the circuit board is brought into contact with the upper or lower part of the connecting terminal **324**.

FIGS. **11***a* to **11***c* are conceptual diagrams illustrating examples of the dome portion attached to the circuit board according to another embodiment of the present invention.

According to the embodiment shown in the drawings, the dome portion **420**, **520**, and **620** is attached to the circuit board **270** and **270***b*, and the key body **410**, **510**, and **610** is separated from the dome portion **420**, **520**, and **620** and accommodated in the accommodating portion **201***b* of the terminal body **204**. When the key body **410**, **510**, and **610** is separated from the dome portion **420**, **520**, and **620**, the dome portion **420**, **520**, and **620** should have a given thickness so that it is pressed by the actuator **314** of the key body **410**, **510**, and **610**. However, the circuit board **270** and **270***b* may not have sufficient thickness due to the trend toward a slimmer terminal body **204**. Accordingly, the dome **420**, **520**, and **620** is manufactured with sufficient thickness, and the dome portion **420**, **520**, and **620** having a given thickness is attached to the circuit board **270** and **270***b*.

FIGS. **11***a* to **11***c* illustrate the shapes of the dome portion **420**, **520**, and **620** and examples where the dome portion **420**, **520**, and **620** is attached to the circuit board **270** and **270***b*.

As shown in FIGS. **11***a* and **11***b*, a dome **421** and **521** is formed on one surface of the dome portion **420** and **520**, and may have an insert portion **427** and **527** which has a Π-shaped cross section by recessing part of the other surface (rear surface) inward. The circuit board **270** is inserted into the insert portion **427** and **527**. A contact portion **271** may be formed on any one surface (e.g., the top, the bottom, or a side surface) of the inserted circuit board **270** so that it is connected to the connecting terminal of the dome portion **420** and **520**.

In this case, the dome portion **520** may be fixed to the circuit board **270** by fastening means (e.g., a screw) that penetrates through the circuit board **270** and the dome portion **520**.

Also, not shown, the dome portion may be fixed to the circuit board **270** by forming a via hole in the circuit board **270** and allowing part of the dome portion to penetrate through the via hole.

As shown in FIG. **11***c*, a dome **621** may be formed on one surface of the dome portion **620**, and grooves **628** may be formed on the side of the dome portion **620**. The circuit board **270***b* may include a recessed portion **279***b* that protrudes from the side and corresponds to the dome portion **620**. As the dome portion **620** is inserted into the recessed portion **279***b*, the dome portion **620** may be attached to the circuit board **270***b*. Also, when mounting the dome portion **620** on the recessed portion **279***b*, some parts **278***b* of the circuit board **270***b* may be inserted into the grooves **628**.

The connecting terminal **624** protrudes from the rear surface of the dome portion **620**, and the connecting terminal **624** is brought into contact with the contact portion **271***b* formed on one surface of the circuit board **270***b*.

According to the embodiment shown in FIGS. **11***a* to **11***c*, a signal generated by the key module can be transmitted to the circuit board, without using the flexible circuit board, by attaching the dome portion and the circuit board together.

FIGS. **12***a* and **12***b* are a perspective view and a cross-sectional view illustrating a first example of a connecting terminal having an up-down symmetrical structure, FIGS. **13***a* and **13***b* are a perspective view and a cross-sectional view illustrating a second example of a connecting terminal having an up-down symmetrical structure, and FIGS. **14***a* and **14***b* are a perspective view and a cross-sectional view illustrating a third example of a connecting terminal having an up-down symmetrical structure.

Referring to FIGS. **12***a* and **12***b*, the upper and lower parts of the connecting terminal **724** are symmetrical with respect to the center. The connecting terminal **724** may include a deformation portion **724***a* and first and second support portions **724***b*. The deformation portion **724***a* may be elastically deformed in a direction toward or away from the dome portion **720**. Therefore, the deformation portion **724***a* and the contact portion may maintain elastic contact with

each other. The first and second support portions **724***b* may be formed on both sides of the deformation portion **724***a*. The first and second support portions **724***b* may elastically support the deformation portion **724***a*. The first and second support portions **724***b* may be fixed to the rear surface of the dome portion **720** by soldering. As such, only a conductive dome is formed on the front surface of the body, so that a water-resistant layer for covering the conductive dome to resist water can be formed more easily. That is, the dome portion **720** can be formed into a more simple shape, and this makes it easier to form a water-resistant layer on the front surface of the dome portion **720**.

Also, any one of the support portions **724***b* may be electrically connected to conductive contact points formed on the dome portion **720**, by which signals generated from the dome portion **720** can be transmitted to the contact portion of the circuit board through the connecting terminal **724**. In this case, the conductive contact points and the support portion **724***b* may be connected together by a conductive pattern formed on the board.

Referring to FIGS. **13***a* and **13***b*, the upper and lower parts of the connecting terminal **824** are symmetrical with respect to the center. The connecting terminal **824** may include a deformation portion **824***a* and first and second support portions **824***b*. The deformation portion **824***a* may be elastically deformed in a direction toward or away from the dome portion **820**. Therefore, the deformation portion **824***a* and the contact portion may maintain elastic contact with each other. The first and second support portions **824***b* may be formed on both sides of the deformation portion **824***a*. The first and second support portions **824***b* may elastically support the deformation portion **824***a*. The first and second support portions **824***b* may be attached to the body in such a way as to cover the sides in the thickness direction of the body. The body may have grooves into which the first and second support portions **824***b* can be inserted and fixed.

The first and second support portions **824***b* may be fixed to the body by soldering.

Also, any one of the support portions **824***b* may be electrically connected to conductive contact points formed on the dome portion **820**, by which signals generated from the dome portion **820** can be transmitted to the contact portion of the circuit board through the connecting terminal **824**. In this case, the conductive contact points and the support portion **824***b* may be connected together by a conductive pattern formed on the board.

Referring to FIGS. **14***a* and **14***b*, the upper and lower parts of the connecting terminal **924** are symmetrical with respect to the center. The connecting terminal **924** may include a deformation portion **924***a* and first and second support portions **924***b*. The deformation portion **924***a* may be elastically deformed in a direction toward or away from the dome portion **920**. Therefore, the deformation portion **924***a* and the contact portion may maintain elastic contact with each other. The first and second support portions **924***b* may be formed on both sides of the deformation portion **924***a*. The first and second support portions **924***b* may elastically support the deformation portion **924***a*. The first and second support portions **924***b* may be fixed to the rear surface of the dome portion **920** by soldering. As such, only a conductive dome is formed on the front surface of the body, so that a water-resistant layer for covering the conductive dome to resist water can be formed more easily. That is, the dome portion **920** can be formed into a more simple shape, and this makes it easier to form a water-resistant layer on the front surface of the dome portion **920**.

Also, any one of the support portions **924***b* may be electrically connected to conductive contact points formed on the dome portion **920**, by which signals generated from the dome portion **920** can be transmitted to the contact portion of the circuit board through the connecting terminal **924**. In this case, the conductive contact points and the support portion **924***b* may be connected together by a conductive pattern formed on the board.

FIGS. **15** to **17** are conceptual diagrams illustrating examples of a connecting module having a connecting terminal according to embodiments of the present invention.

Connection modules are modules that electrically connect an external device to structures within a terminal. Examples of the connection modules may include an earjack for connecting an external sound output device, such as an earphone, to equipment inside a terminal, a socket for electrically connecting an external interface to internal equipment, or a power key.

The structures of the above-described body and connecting terminal may be implemented in connecting modules **1000**, **1100**, and **1200**. That is, conductive contact points **1025**, **1125**, and **1225** that are electrically connected to external devices may be formed on one surface of the body **1020**, **1120**, and **1220**, and a connecting terminal that is electrically connected to internal equipment may be formed on the other surface of the body.

The connecting terminal **1024**, **1124**, and **1224** may include a deformation portion **1024***a*, **1124***a*, and **1224***a* and first and second support portions **1024***b*, **1124***b*, and **1224***b*. The deformation portion may be elastically deformed in a direction toward or away from the body. Therefore, the deformation portion and the contact portion may maintain elastic contact with each other. The first and second support portions may be formed on both sides of the deformation portion. The first and second support portions may elastically support the deformation portion.

Any one of the first and second support portions may be electrically connected to the conductive contact points formed on the body, by which signals generated from external devices can be transmitted to internal devices through the connecting terminal, or signals from internal devices can be transmitted to external devices.

In a connecting module related to at least one of the embodiments of the present invention which have the above-described configurations, the upper and lower parts of the connecting terminal are symmetrical, and therefore the assembly direction is not limited. Also, the connecting terminal can be prevented from being twisted or bent upon impact, and can make stable contact with the contact portion.

Moreover, the simplified structure makes it easier to form a water-resistant layer on one surface of the connecting module.

In addition, the deformation portion is elastically deformed in a direction toward or away from the body and supported by the support portions so as to avoid deformation in an up-and-down direction. Therefore, the deformation portion can make stable contact with the contact portion, even upon impact.

The foregoing embodiments and advantages are merely exemplary and are not to be considered as limiting the present disclosure. The present teachings can be readily applied to other types of apparatuses. This description is intended to be illustrative, and not to limit the scope of the claims. Many alternatives, modifications, and variations will be apparent to those skilled in the art. The features, structures, methods, and other characteristics of the exemplary

embodiments described herein may be combined in various ways to obtain additional and/or alternative exemplary embodiments.

As the present features may be embodied in several forms without departing from the characteristics thereof, it should also be understood that the above-described embodiments are not limited by any of the details of the foregoing description, unless otherwise specified, but rather should be considered broadly within its scope as defined in the appended claims, and therefore all changes and modifications that fall within the metes and bounds of the claims, or equivalents of such metes and bounds are therefore intended to be embraced by the appended claims.

Any reference in this specification to "one embodiment," "an embodiment," "example embodiment," etc., means that a particular feature, structure, or characteristic described in connection with the embodiment is included in at least one embodiment of the invention. The appearances of such phrases in various places in the specification are not necessarily all referring to the same embodiment. Further, when a particular feature, structure, or characteristic is described in connection with any embodiment, it is submitted that it is within the purview of one skilled in the art to effect such feature, structure, or characteristic in connection with other ones of the embodiments.

Although embodiments have been described with reference to a number of illustrative embodiments thereof, it should be understood that numerous other modifications and embodiments can be devised by those skilled in the art that will fall within the spirit and scope of the principles of this disclosure. More particularly, various variations and modifications are possible in the component parts and/or arrangements of the subject combination arrangement within the scope of the disclosure, the drawings and the appended claims. In addition to variations and modifications in the component parts and/or arrangements, alternative uses will also be apparent to those skilled in the art.

What is claimed is:

1. A connecting module comprising:
- a body having conductive contact points formed on a surface of the body; and
- a connecting terminal exposed to a surface of the body, and the connecting terminal being electrically connected to the conductive contact points,
- the connecting terminal including:
  - a deformation portion to elastically deform in a direction toward the body or away from the body; and
  - a first support portion at a first end region of the deformation portion and a second support portion at a second end region of the deformation portion, wherein both the first support portion and the second support portion are inserted into the body such that the first and the second support portions are fixed into the body, and
  - wherein the deformation portion is elastically supported by the first and second support portion that are fixed into the body such that the deformation portion has a curved shape from the first end region to the second end region.

2. The connecting module of claim **1**, further comprising a board to be electrically connected to the conductive contact points.

3. The connecting module of claim **2**, wherein the connecting terminal is to be electrically connected to the board.

4. A mobile terminal comprising:
- a terminal body; and
- a key module on the terminal body,
- the key module including:
  - a key body;
  - a dome portion to generate a signal based on an input to the key body; and
  - a connecting terminal to attach to the dome portion,
  - the connecting terminal including:
  - a deformation portion to elastically deform in a direction toward the body or away from the key body; and
  - a first support portion at a first end of the deformation portion and a second support portion at a second end of the deformation portion, wherein both the first support portion and the second support portion are inserted into the dome portion such that the first and the second support portions are fixed into the dome portion, and
  - wherein the deformation portion is elastically supported by the first and second support portion that are fixed into the dome portion such that the deformation portion has a curved shape from the first end to the second end of the deformation portion.

5. The mobile terminal of claim **4**, wherein the dome portion includes attaching portions that extend in a length direction of the terminal body, and the attaching portions are to be provided into grooves of the terminal body.

6. The mobile terminal of claim **4**, wherein the connecting terminal is in contact with a contact portion of a circuit board that faces the connecting terminal so as to provide a signal to the circuit board in the terminal body.

7. The mobile terminal of claim **6**, wherein the connecting terminal is a conductive terminal to elastically deform when in contact with the contact portion of the circuit board.

8. The mobile terminal of claim **6**, wherein the contact portion is at an accommodating portion that supports the dome portion on a side of the terminal body.

9. The mobile terminal of claim **6**, wherein the circuit board includes a recessed portion that is recessed inward from a side of the circuit board, and the dome portion is to be provided into the recessed portion.

10. The mobile terminal of claim **6**, wherein the dome portion is attached to the circuit board by a fastening device that penetrates through the circuit board and the dome portion.

11. The mobile terminal of claim **6**, wherein the dome portion includes an inwardly recessed insert portion, and the circuit board is provided to the insert portion.

12. The mobile terminal of claim **4**, wherein an actuator is formed at a rear surface of the key body to contact a dome.

13. The mobile terminal of claim **4**, wherein the key body includes:
- a manipulating portion to provide an outer appearance of the key body;
- a pressure portion attached to the manipulating portion, the pressure portion having an actuator, and the pressure portion being formed integrally with the dome portion; and
- a support portion to support the pressure portion.

14. The mobile terminal of claim **13**, wherein the dome portion includes a separation member to protrude toward the pressure portion from a surface of the dome portion so as to separate a dome from the actuator by a predetermined gap.

* * * * *